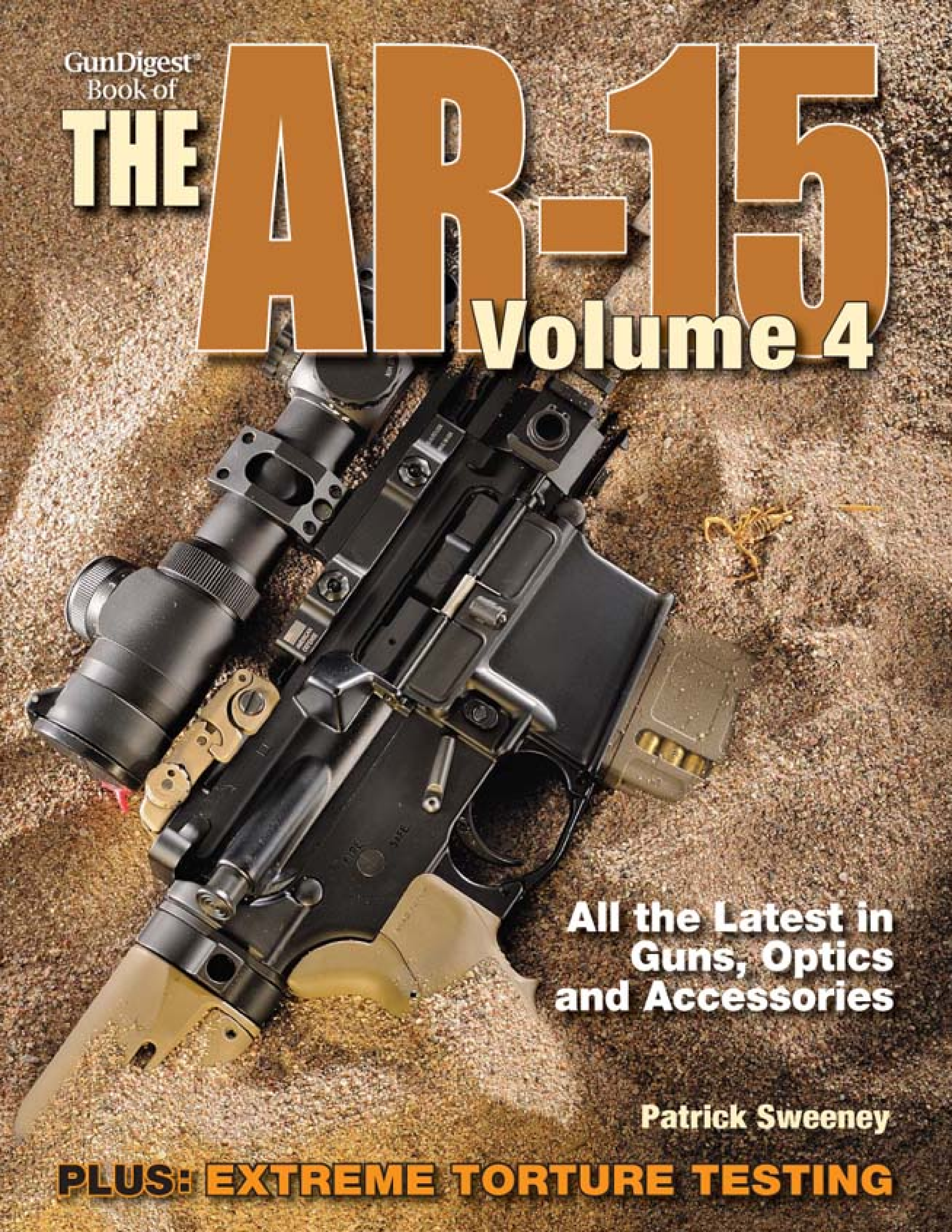
GunDigest® Book of

THE AR-15

Volume 4



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Patrick Sweeney

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Gun Digest®

Book of

THE AR-15

Volume 4

PATRICK SWEENEY

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DEDICATION

This is my first book without the late Dan Shideler to assist in keeping me on track. I'm sure whoever takes over will do an exemplary job, but his wicked and my droll sense of humor meshed quite well. I miss him.

The many readers who have told me "you have to do this" or "you have to test that" should all give themselves a pat on the back if they see their idea, question or even curiosity answered in this book. I tried to go past the usual "Hey, I shot it, it's great, you should buy it" that seems to pervade so much writing. Oh, don't get me wrong, there's a lot of gear you should buy, but I realize that not everyone has a big budget (heck, I don't) and buying smart is part of buying today.

A nod of thanks to the many police officers I get to instruct each year. They offer a perspective I don't have; that is, they in many cases don't care about guns. They just want the essential piece of lifesaving gear they've been issued to work properly when they need it. The non-maven perspective is useful, because someone who

doesn't obsess over the details reminds us all there are more important things to consider: Did it work? Is the bad guy done? Do the good guys go home?

And, to the good guys and gals who are out there at the borders, the ones who stand a watch looking out into the darkness, or patrol dangerous areas, looking for bad guys: Thank you.

Finally, Felicia, and the poodle dudes. My center, my oasis and pack.

CONTENTS

PREFACE

The AR-15 seems to be evergreen. The equipment features are easy: the modular nature of the AR lends itself to mix-n-match assembly. If you want a single lower with several uppers, you can do that. If you want to re-build it, you can do that. If you want to experiment (within the bounds of legal authority), you can do that.

Therein also lies the drawback, the weakness, of the AR: anyone with a few simple tools can get in there and screw things up. Back when I was gunsmithing for a living, in one of the earlier assault weapons panics I found myself with a near-deluge of nonworking ARs in need of repair. Once I'd poked around in a few and worked out how they functioned, I discovered that a lot of the errors were easy fixes. I had a simple price schedule for prospective customers: If they hadn't irreparably ground/cut on parts, I could go through their rifle and fix whatever was needed for $100. (This was back in the days of gasoline less than a dollar a gallon.) If they had ground/cut something, I'd let them know what it was, and what it would cost, before proceeding further.

The biggest reason the AR is in the hands of so many shooters, collectors and brand-new owners comes to us courtesy of politics. With the sunset of the Assault Weapons Ban of 1994 (back in 2004) lots of people looked into buying ARs. They could now, so they did. They actually could have before, but not many knew that. It is a beautiful demonstration of the Law of Unintended Consequences.

Then, with the run-up to the 2008 Presidential Election, candidate Barack Obama caused sales of ARs, indeed, anything that was considered a potential object of banning, to sell like hotcakes. So effective was his sales pitch that sales did not drop off after he was elected, at least not until the economy soured and disposable income became not-so-disposable.

Estimates of the DNC sales effort (which is what it, in effect, ended up being), in some cases, have the number of AR owners doubling. *Doubling*. We now have a situation where there may well be more new owners of AR-15s than there are old hands. Which, I am not the least bit shy in saying, is good for me and all of us if we work to make the new owners happy and ensure they have fun and stay safe.

So, for all owners of AR, new and old hands, there are a number of old wives' tales, shibboleths, that must be debunked. I have done some before, but this volume will be much different than the earlier AR-15 volumes. Yes, we'll have some equipment reviews; after all, we're all addicted to this particular rifle, and we have to know what is new in rifles, optics, ammo and associated gear.

But the main focus of this volume will be testing and abuse. I will be testing ARs in ways that you will not have read about except from declassified government testing. I must admit, and warn you, I do not have a multi-million dollar lab in which to test rifles, so there are limits. I cannot test to destruction although I do come very close in some instances. For example, I have in my hands (well, on my hard drive) a report the government did to test M4 barrels. They put the rifles in a fixture and slammed full-magazine full-auto bursts through them until the barrels essentially melted. The barrels became over-heated and soft, sagged, and bullets exited the side of the barrel, thus ending each test. "What the frak?," you ask? Why do that? Simple: in a military context, someone, somewhere, is going to use an M4 as an impromptu SAW, and the government would like to know how long that usage would last. Answer: a bit less than 400 rounds, depending on ambient temperature.

Me, I did a less-abusive and more likely test, and measured temperatures, since it is unsafe to melt barrels while firing rifles unless they are locked in an armored room at the time.

But, I buried them in dirt and sand, submerged them in water, dropped them from heights, ran over them with various vehicles, froze them and shot them with damaged ammo to get an idea of how much abuse they can withstand.

When I was done I was still left with a question: Where are all these unreliable AR-15/M16s I've been hearing about? Because it was very, very hard to get them to malfunction and, short of damage, they wouldn't quit.

INTRODUCTION

WHAT ARE WE TRYING TO DO HERE?

There are a number of laws that run the universe. We are all familiar (or so we think) with Newton's laws. Inertia, action and opposite reaction, and so on. That heat propagates through an object, and dissipates, and the gases expand or contract, according to the whims of the moment and how much energy we pump into the system.

All true, and all relevant. If you do not know, for instance, that Newtons' First Law means your bolt will stay in place until the gas or piston works on it, you will be woefully un-prepared to keep it running.

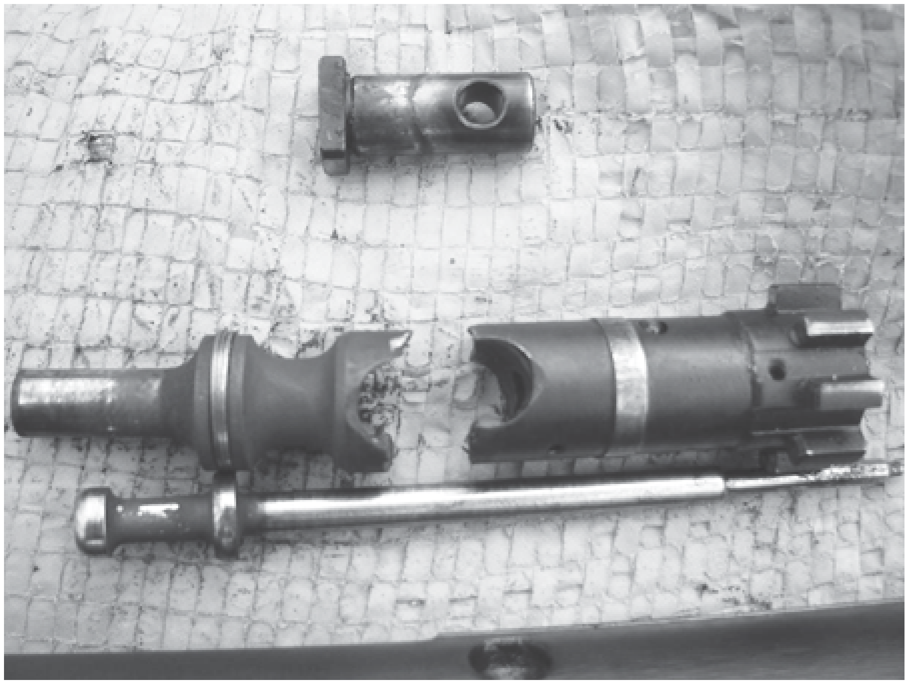
But there are laws we are subject to, that work in the real world, that have not really been codified. Some because it would be an impossible task to nail them down. Others because to nail them down would seem to obviate free will.

Perhaps the most famous is Murphy's Law; "If anything can go wrong, it will. And usually at the most inopportune time." You've planned for, and looked forward to, a particular match for a long time. When will your extractor break? Why, in the middle of the biggest stage of the match, that's when. And it will break only if you do not have a spare extractor/bolt/rifle with you. If you have a spare, you'll be spared. As a friend of mind has said on more than one occasion; "It is Murphy's law, not Murphy's suggestion."

And not just breaking, but forgetting. If you pack the car for an important trip, what one thing will you forget? The one thing you can't buy along the way, and which will completely negate the reason for the trip.

How do you deal with Mr. Murphy? (And where the heck did he come from?) Simple. Realizing that anything can go wrong, you stock spares. You pack a spare parts box in your bug-out bag or gear. And, if you are going to pack for a trip, expedition, mission, whatever, you have a checklist. And you use it.

A second law is Pareto's Principle, which I learned back in college as the 80-20 rule. There have been numerous observations, and even mathematical equations formulated, but it comes down to a simple expression often noted in business: 80% of your sales volume comes from 20% of your customers. This can be generalized a number of ways. That 20% of the people who walk into, say, a gun shop, will enact 80% of the purchases, by dollar total. Or that 20% of the calibers on the shelf behind you will represent 80% of the ammo sales leading up to opening day.

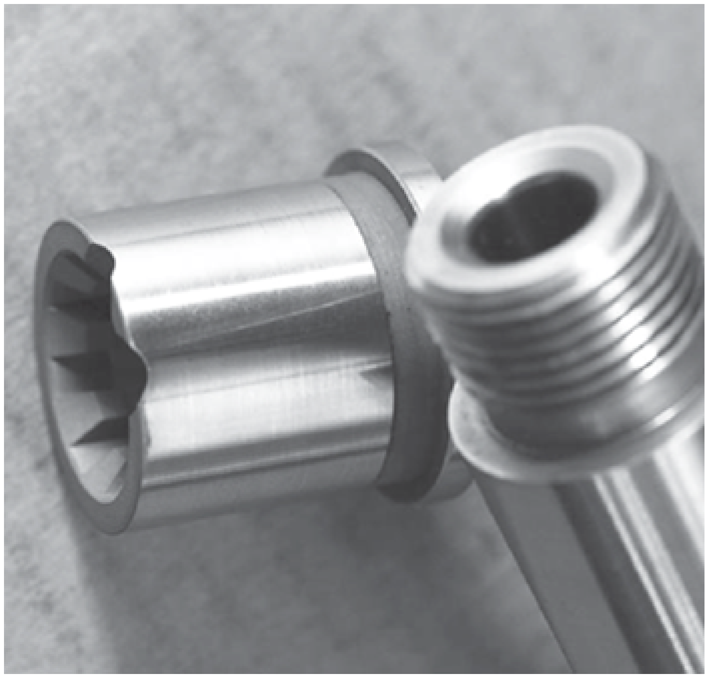


Rare, yes. But since we're basically stuck with 1950s-era alloys (that's what mil-spec demands), if the bolt maker does anything the least bit wrong, we get broken bolts. (Photo courtesy Ned Christiansen.)

This has lead to many "brilliant" business solutions and business books. With such self-evident efficiency improvers as stocking just the 20% of ammo that represent the 80% of sales. Or "firing" the 20% of customers who are the ones who inspire headaches.

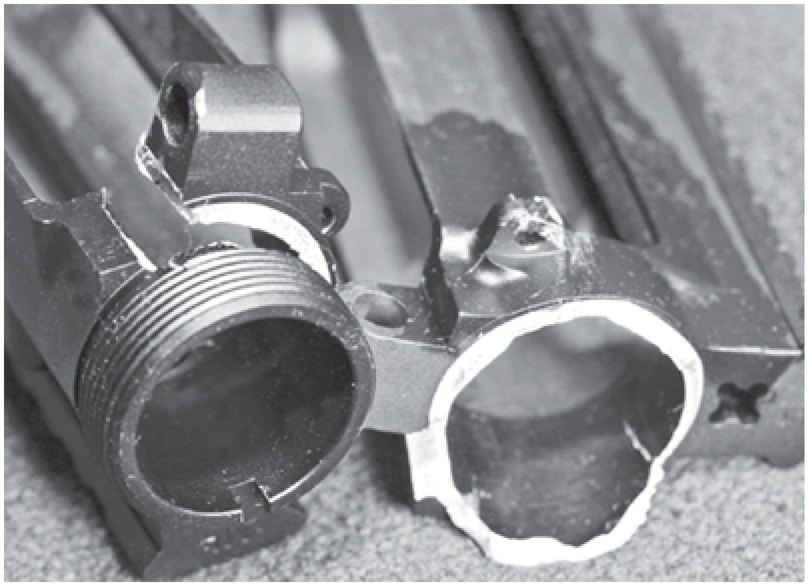
And the "efficiency" of only stocking the 20% of ammo? Remember, the principle always works. Once you have pared your stock down to that 20%, you'll still have 20% of that 20% that represent 80% of your current sales. If you follow it to its logical (and absurd) conclusion, you'll only stock one brand/caliber/bullet weight of ammo. The trick isn't in knowing the 80/20 rule, it is in knowing where to draw the line.

How does this inform our AR-15 purchases, use and desires? Simple: 80% of the malfunctions will come from 20% of the possible sources. When something goes wrong, it can't be "everything," there is a definite source to the problem. Find that, and most of your problems will go away.



Could designers come up with a better method? Unlikely, so we use an old design, but one that works just fine. Some old things need not be "improved."

The Marine Corps has been using a variation of the Pareto Principle for some time now. When faced with a problem, the process is to come up with three possible solutions, solutions that will get you 80% of the way to "fixed" or solved. Pick one, apply it and adjust as needed. Then run the process again, with three quick options, and repeat. An 80% solution, run through in three rapid successions, gets you to the 99% level of solution. Not bad, for a fast-and-dirty means of solving a problem.



Most of your problems will come from a small subset of the group. Fix them, and you've fixed most of your problems.

How does this help us? Simple. If you have extraction problems, find the most-likely candidate and apply the solution. Yes, you could have an over-sized gas port, but it is more likely that an O-ring or D-Fender will add sufficient extractor force to solve your problem. Now, the objection to this is that the O-ring or D-Fender might just be a band-aid solution, and the real problem is still there.

Yes, but the rifle works now. You can spend time delving into the intricacies of the problem, learning as you go and eventually solving the exact cause. But for now, your rifle works. And when the zombie apocalypse is upon us, do you really want to still be in problem-solving mode, or do you want a rifle that works?

Quality also enters into the 80/20 rule. 80% of the problems that arise with malfunctions and busted parts come from 20% of the makers and vendors. This seems obvious, but it is taken to extremes when someone insists that only the absolute best parts, fabricated by naked Norse goddesses chanting druid good luck vows in the light of a full moon, made to current mil-spec requirements, and washed in pure glacial meltwater, then gold-plated, foil-wrapped and inventoried by Benedictine monks until ordered should be used.

Okay, that's a bit over the top, but you get the idea. Or rather, they have lost it. You escape the 20% of problem parts by buying in the top 80%, not the top 8%. If you keep that in mind, you will find there are a whole raft of parts, rifles, accessories and extras that will improve your AR, your shooting, and your chance of surviving the Z wars, without breaking the bank.

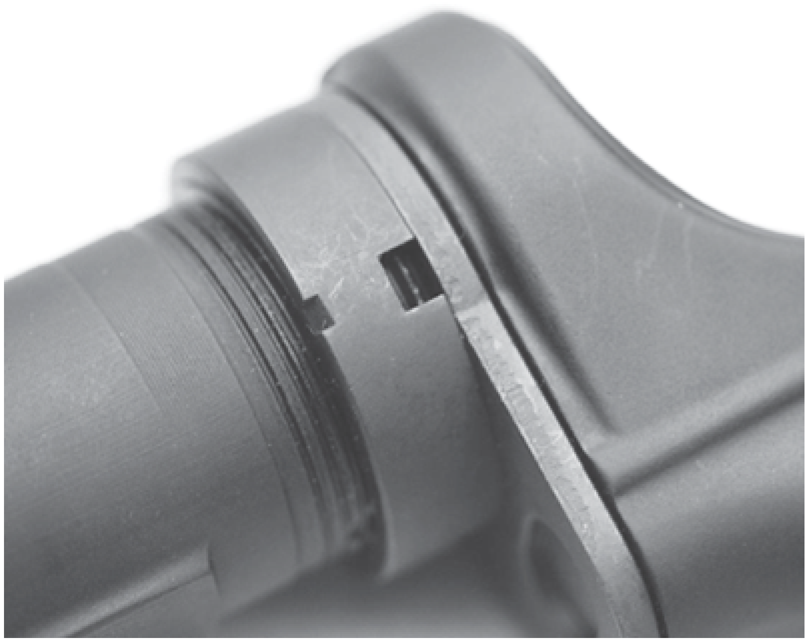
The last law we'll consider comes by way of Albert Einstein. Once, when asked what the desired outcome of an experiment was, he replied "If we knew what we were doing, it wouldn't' be research." I call it Einstein's Attitude. As spoken, it seems to make him seem like a bit of a dunce. I mean, you don't know what you're doing? But what he was trying to point out, and what another bright spark also demonstrated, was that if you set out to prove something, you may not see the really important stuff happening along the way. You have to see what's there, not just what you were looking for.

That other luminary, Thomas Edison? When a critic pointed out that he had done hundreds of fruitless experiments on perfecting the light bulb, he corrected them. "I learned hundreds of ways not to make a light bulb." Sometimes it is just as important to exclude things as to prove things.

While not really a law, or expressed as one, there is the further consideration of improvers, experimenters, refiners and tweakers. (Not meth users, but people who fiddle with designs.)

Inventors invent. Tweakers improve. Eugene Stoner invented the AR, at least in so far as he perfected the form. Since then, we have had more than half a century of tweaking, and as a result, the rifle we now have is far superior to the one he produced. More accurate, reliable, durable and ergonomic. Part of tweaking is testing. Is a particular twist an actual improvement? There's one way to find out. As part of the improvement process, competition can be a great accelerant. As long as the competition isn't too hidebound and restrictive, or lost in the theoretical world, competition is good.

Sure, you can buy bad extractors. But if all your rifles break extractors like this, regardless of where you acquired them, extractors might not be your problem. Start looking elsewhere.



Simple things can matter, and if you don't know, you don't know. The "assembler" of this rifle couldn't figure out why he couldn't keep the castle nut tight.

The heavy hand of mil-spec has been used for decades to keep the AR from evolving and being improved. Police use of the AR lagged behind, and when initially adopted, not materially changed or improved over military use. It wasn't until competition shooters started adopting the AR in large numbers, and experimenting to improve it, that the AR really got a lot better. Oh, there will be those who will try to tell you that the M4 you see in the hands of an SF trooper is what it is because the Army tested, re-tested, refined and adopted all the parts that went into it. I wish it were true. But, as I've said before, and you can easily see for yourself in photos from Iraq and Afghanistan, except for the laser targeting designator, the M4 you see in those photos is about where a good competition-built AR was in the mid-1990s. The Army performed harsher tests to check durability, but it was the USPSA/IPSC shooters who improved handling, accessories, function and reliability. It was the NRA High Power shooters who perfected long-range accuracy.

All done by a swarm of experimenters, improvers, refiners and tweakers. And barring some catastrophic change in the law, we'll keep on improving. When the next big thing appears and replaces the AR-15, the first thing that swarm will do is start all over again on the new rifle. And it won't take long and their industry, experimenting and competition efforts will have refined the replacement rifle more than million-dollar budgets of the DoD will have.

So, as we go through the experimental sections of this book, keep in mind that I'm not trying to prove anything. I'm trying to figure stuff out and see what happens along the way. If I haven't proven something to your satisfaction, well, there are more experiments to perform. Just keep these in mind when you begin your own tweaking.

ADCOR

If you only looked at the receiver, the ADCOR DI carbine would seem just like any other.

While they made their initial splash as a piston-driven rifle company, ADCOR realized that not everyone has climbed aboard the piston bandwagon. So they came out with a direct-gas AR, one with a difference.

The ejection port is not your normal door. The carrier is not a normal carrier. The carrier (to take things in their order of importance) has on its ejection port area a "wiper." This acts to seal the edges of the ejection port against entry of dust, dirt, mud, etc. As I saw in the shotgun-shooting of ARs, the ejection port allows a lot of stuff to come (or in that case, be forced) in. The wiper is a close-fitting synthetic appliqué that dust wipes off of as the carrier cycles, and the edges seal. Since the carrier is no longer the normal and accepted shape, ADCOR had to change the ejection port door. They probably could have done away with it, but AR buyers are

accustomed to seeing an ejection port door, so ADCOR put one there. It has its latch, however, at the rear and not the top.

Once you notice it, and then forget it, you never need think about it.

Also, the ADCOR DI carbine has two ways of charging the action: the regular one, and the charging handle that is on the handguard, just behind the front sight. It is a folding handle, and non-reciprocating, so you don't have to worry about having your hand in the way. At the front of the sight assembly is the gas system assembly, and the front bolt is marked as to the caliber it is made for. To me this indicates that ADCOR has plans for an identical rifle in 6.8, 6.5 or maybe even .300 AAC Blackout/Whisper.

Once you get past the differences, you realize that ADCOR has filled the bill in all other respects: it uses proper alloys, forged upper and lowers, heavy phosphating and so-on. It is a first-class rifle.

The rifle shipped has Magpul sights on it, and since the top rail is a continuation of the receiver you can mount anything that will fit and that your wallet can afford. And since the rest of the rifle is also unchanged, your favorite accessories will bolt on where you want them or expect them to.

Now, for the piston gun I abused, I shoveled dirt, sand and snow on it, and it did not fail. I would not expect the DI gun to do any less, but I refrained from abusing their hospitality and simply shot it a lot. It worked as you'd expect a 21st century AR to work: without fail.

"ADCOR?" you ask? A new gun company? Yes, but not like other gun companies. In a lot of instances, a gun company springs up when someone who loves guns puts together the means to start making them. Adcor Defense is part of ADCOR, a heavy industry manufacturer. They make the tools that others use to make rifles and rifle-sized objects. Making rifles to them is not just improving what they like, but doing so with the lessons learned from bigger, heavier machinery. Gauging by the improvements they've made in the short while I've known about them, I suspect they will be

coming out with a lot more innovative details to improve our favorite rifle.

The carrier wiper keeps gunk out of the rifle.

The ejection port cover doesn't look the same, because it isn't. The latch is at the rear, for one thing.

Adcor Defense is a division of a company that has been making production machinery for a long time. They know how to make stuff.

The front end looks different, as it has to accommodate the charging handle and the gas system access.

The front knob of the gas system is a clue; it would seem they intend to make other calibers, too.

When it comes time to get a round in the chamber, you suddenly realize this isn't your father's AR.

If you're looking for a first-class AR, don't forget the ADCOR.

CUTE LITTLE .300S

Accurate? Of course it is accurate, no one makes inaccurate ammo or rifles any more. The market won't stand for it.

While the base starting point of the Whisper and others was the .221, the best way to get it is as factory brass. No need to cut and re-form your own brass.

Leading into the reviews of the various .300s of the smaller-than-.308 size, I figured I'd give you a bit of background and overview.

A long time ago, there was this crusty old guy by the name of J.D. Jones. A prolific inventor, he and Larry Kelly of Mag-na-Port fame used handguns to slay just about every critter than walked, swam, flew and slithered across the globe. Actually, back then J.D. wasn't old, but he certainly was of firm opinion.

The workshop of J.D. is SSK Industries, where he made many wondrous things. After he designed handgun cartridges so big and powerful that no sane individual would shoot them, he turned his attention to certain aspects of rifles. In particular, how to make them quiet. Now for most inventors, the obvious way to make a rifle quiet is to put a "can" on it. A suppressor. A silencer, for those who haven't caught up in the language.

J.D. decided that, while a suppressor was obviously needed, you could get a lot further if you started first with a cartridge that didn't produce as much of the stuff you needed to silence. Clearly, this

leads us to the lowly .22LR, so quiet that further suppressing it produces awe-inspiring levels of quietness. However, not everyone is impressed by the .22LR, even while being shot by it. Something more robust is called for. J.D. wanted to do several things:

- He wanted a cartridge that would require the least modification of an existing rifle design.

The elegant thing about the .300s is that they use the standard AR-10 thread pattern for fl ash hider and suppressor mounts.

- He wanted the most impact he could get, at the lowest sound level.

- He wanted the least fabrication of components. If at all possible, everything should be an off-the-shelf item.

- He wanted it compact. A super-quiet rifle the size of a belt-fed machine gun was stupid.

The most common firearm in military use at the time (and still, really) was the M16. This was before the M4, so a shorter, carbine version of the M16 would have been a Colt Commando or one of the carbines Colt had made. So, starting with the M16/AR-15, J.D. got to work. Going to a bigger cartridge case was not an option, as there were not bolts other than the 5.56-diameter bolt-face bolts extant.

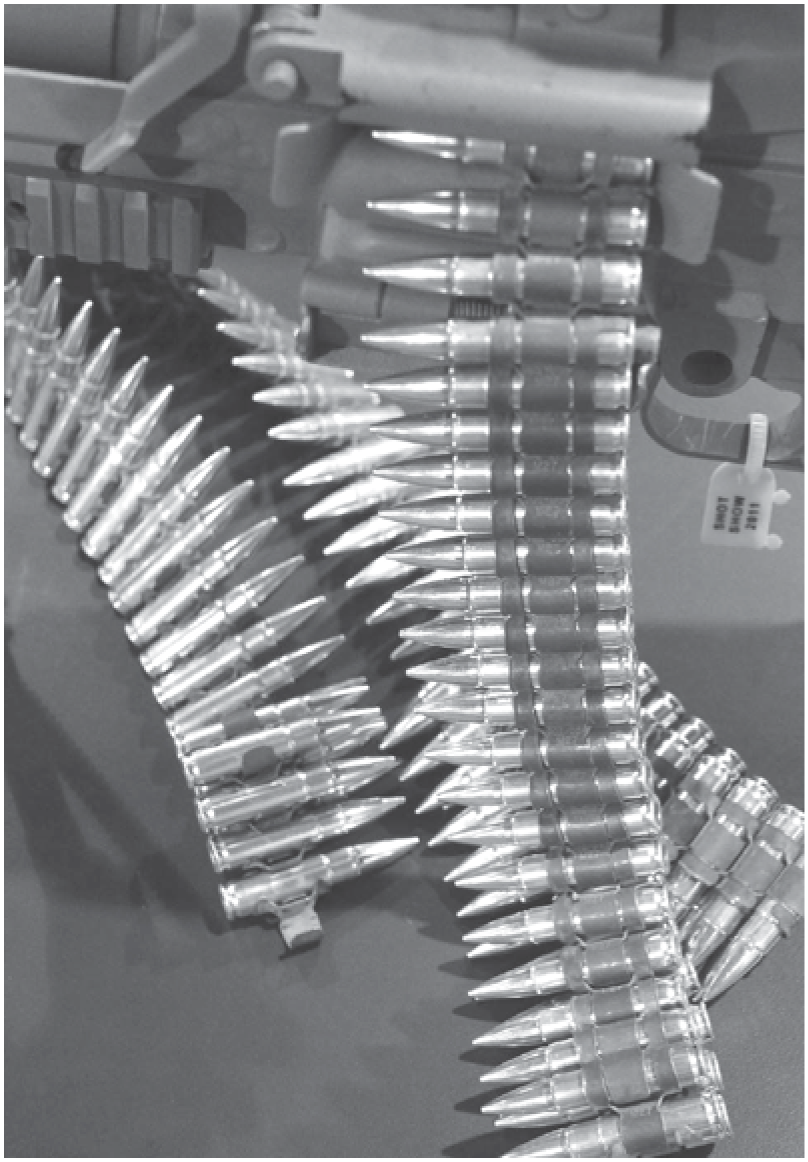
J.D. was doing his research in the early 1980s, and Colt didn't come out with the Lightweight Sporter in 7.62X39 until 1993.

Not wanting to make new bolts, he used the existing one. The problem with the .223/5.56 was velocity. To gain that velocity, the case uses a bunch of powder (relatively speaking) and pushes a light bullet very fast. Could he use a heavier bullet? Not unless he went to a larger diameter. Bigger means a shorter case, in this instance a good thing. As he went larger and larger, he had to get shorter and shorter. Finally, at .308" bullet diameter, he struck on the combo: take the existing .221 Fireball case, neck it up to .308" bullet diameter, and make the whole thing short enough to fit into an AR-15/M16 magazine.

Which is kind of like telling Rembrandt "You need to make the backgrounds a bid darker, to bring out the subjects."

But there were problems, and details to sort out. There's still enough case capacity to boost regular .308 bullets supersonic. And subsonic bullets, of 150 grains, don't do anything that a suppressed 9mm already did. So, he kept boosting bullet weight. This led to further problems. You see, longer bullets end up with the ogive (the curved nose portion of the bullet) rubbing on, and being crabbed by, an internal stiffening rib of the AR mag. So, he had to be careful of overall length.

But the end result was impressive. A 220 grain, subsonic bullet, launched out of a suppressed AR, was impressively quiet. How quiet? I watched my friend Ned Christiansen shooting a .300 Whisper (the name J.D. gave his cartridge) AR with a can on it. This was at Second Chance, and he was plinking on the LRPF falling plate bowling pins on the back range. For a while, the only sounds were the empties hitting the ground, the syrupy sound of the bolt shuffling back and forth, and the bullets smacking onto the timber glacis in front of the pin racks. Once he found the point of impact (to call the trajectory of the 220s "rainbow" is to say that rainbows are relatively flat) the plates went down with more noise than any other step in the process.



Since the .300s fit the same profile as the .223/5.56 rounds, you can convert most anything in .223/5.56 to accept the .300 AAC & Whisper. And yes, this would be fun.

The barrels you can get in .300 (either type) will have fast twists. Where a .308 Winchester would have a 1/10 twist, the 300 AAC 7 Whisper have 1/8, 1/7.5 or 1/7 twists.

The initial reaction many have is, “So what, a .45 ACP fires a 230 subsonic, why this?” Simple: a .45 ACP carbine is not a trivial thing to manage. Let’s assume you wanted to do it (as an individual or a law enforcement agency, even perhaps the US military), where would you go? A Thompson? A quick search turns up Dealer Samples (only another Class 3 dealer can buy one) for $7,000, and a beautiful Colt 1921 for only $30,000. Ouch. And that’s a common .45 smg.

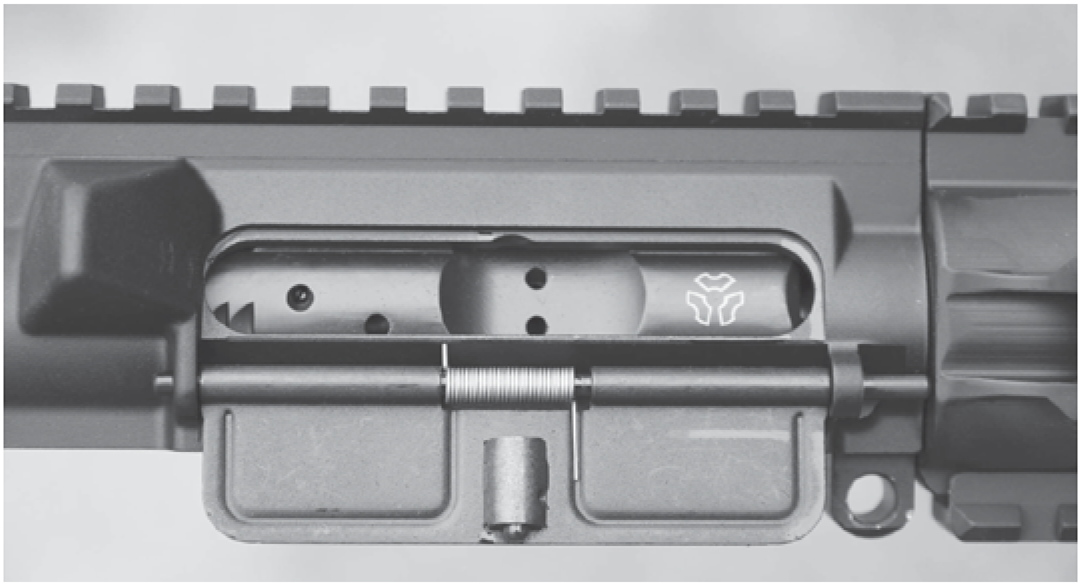
Converting an AR (perhaps now the most common rifle in America) is an incredible hassle. First of all you have to make it a blowback, and then you have to decide what kind of magazine you’re going to modify the receiver to accept. I had an excellent .45 ACP carbine, made by Olympic Arms, and I regretted selling it almost as soon as it left my hands.

To convert an AR to .300 Whisper takes but one part: the barrel. Oh, you can modify everything else if you want to, but the barrel is the only required part.

The result is an interesting hammer with which to quietly strike down the bad guys. A 220 at 950 fps is not exactly the hammer of Thor, but it is plenty good enough to settle accounts. It is pretty close to what a .45 ACP, hot-loaded or +P, would do, out of a handgun. However, there is a bonus. I found this out when testing Hornady 208 grain A-Max ammo in ballistic gelatin, from an S&W M&P15 in .300 Whisper. The .45 ACP, and its standard 230 round-nosed jacketed bullet, will penetrate through two blocks of ballistic gelatin (over 32 inches) in a dead-straight line. It will create a permanent wound cavity of, you guessed it, .451” in diameter.

The twist rate on the .300 Whisper is one turn in ten inches, the standard rate for all .308” rifles. It is spectacularly unsuited to keeping bullets point-first at the subsonic velocities the .300 Whisper pushes them. As a result, the bullets are unstable, and they go end-for-end soon after entering the ballistic gelatin. In fact, they go end-for-end-for-end. I was using large, rifle-sized blocks, and the extra (eight inches square on the receiving end, instead of six inches for handguns) allowed me to collect many sample bullets. They had flipped over twice, and at the twenty-inch depth of gelatin range, were attempting to exit the blocks by the sides. The bullets were undamaged, and except for the rifling marks on them could be loaded and fired again.

Along with their uppers and barrels, AAC offers suppressors. Actually, they made suppressors long before they started making things-300.



If you are converting an AR to one of the .300s, the only thing you need different is the barrel. Bolt, carrier, upper, accessories, all are the same.

So, a quick calculation: .308” bullet, A-Max length, (carry the two....), comes out to having nearly twice the surface area when going sideways as a standard 230 hardball going sharper-end first. A .308” bullet, going sideways, has got to hurt.

As the project progressed, using .221 Fireball brass turned out to not be such a good idea. It meant being at the mercy of the supply of .221 Fireball brass, not a common brass, not easily found or even regularly produced. So, J.D. had brass made. It was easy enough to do a bit of experimenting and work out the exact length to cut .223/5.56 brass to, and then neck it down (by the time it was that short, it was full-body case diameter) to .308”. Double bonus! Not only was the Whisper on a common rifle, needing but a barrel, the shooters of the regular caliber were prodigious in creating once-fired brass to be cut down to .300 Whisper.

Life was good. However, there was the small matter of making it a standard item.

The group that sets the dimensional standards for ammunition in the United States is SAAMI – the Small Arms and Ammunition Manufacturing Institute. SAAMI (pronounced “Sammy”) does not

invent anything. They simply act as the clearinghouse of record for the dimensions, pressures, etc., of a caliber and its chamber. Members can propose cartridges. Accepted cartridges get named by those proposing them. Once accepted, the dimensions are in the realm of “freeware” in the software industry. Anyone can make it, but if they make bad ammo they’ll go out of business, regardless of the product being something SAAMI has approved.

If you want to get your whiz-bang cartridge SAAMI-approved, you have to have a member of SAAMI bring it up at one of the semi-annual meetings. Of course if you don’t, you can control who makes it and who gets to call their product by your name, and charge a licensing fee. So, “in” and its it free for anyone, “not in” and you can make it your own product and recoup some of your R&D investment.

J.D. decided to keep it for his own, and that caused some problems over time. Anyone could make a similar product and call it what they wanted. But, if you had someone else do it, you had to be sure you made your own brass, and reloaded to fit your own rifle. There was no interchangeability between makers. (The downside of proprietary cartridges.)

Then, Steve Hornady at Hornady ammo put .300 Whisper into full, public production. He got it approved by C.I.P., the European standards organization, and offered two loads: a supersonic 110 grain V-Max and a 208 subsonic A-Max. To back it up, Smith & Wesson started offering their M&P15 in .300 Whisper. All it takes is a new barrel, right?

Now, at this point it is worth taking a slight sidestep to look at super vs. sub sonic. Depending on the altitude and density, air temperature and even humidity, the speed of sound is roughly around 1,120 fps. Above that, you get the supersonic “crack” of the bullet creating a shock wave. Below that, you just get the normal muzzle blast and bullet passage.

To get a 110, 125 or 150 grain bullet to go supersonic, in the case of Whisper, requires powders in a particular burn rate range. To

merely boot 200+ grain bullets to subsonic takes powders in a different range. To make them as efficient as possible, J.D. Jones approach was to load the best powder for that application, and he made his barrels to accommodate that. His barrels have a switchable gas block for high and low. You want to turn the setting from one to the other if you use his approach or his ammo.

Hornady was not so keen on that, and they created their ammo so that it would work with the ammo commingled. The two loads will eject their brass to two different angles and distances, but they both work.

From the originator, J.D. Jones, you have a bunch more choices in bullets. He makes some bullets that you'd expect to have microchips in them, they are so high-tech. How about a heavyweight subsonic with a turned-brass bullet that is notched to create petals? The bullet not only overturns, it breaks off the petals, and generally acts like a miniature food processor set on frappé.

This leads us to the next step.

.300 AAC Blackout

Advanced Armament Company is a suppressor company that also makes rifles. They were bought by the same company that owns Remington and folded into the family. Their work on a subsonic cartridge was going on as this happened, and one of the aspects of the purchase was a delay in getting the new cartridge product out. But it is out now, as the .300 AAC Blackout, made by Remington.

This surefire .308 suppressor is efficient for a .308. For anything in the .300s it is veritable vacuum cleaner of a can.

The big controversy when the Blackout was unveiled centered around the cry "they stole J.D.'s design." With all due respect, I have to look at it from the perspective of an engineer, gunsmith and reloader. Given the constraints the magazine imposes, the limits the bullets intended to be used put on case design, and the need to make the resultant cartridge as simple a conversion as possible, I'm not sure you could come up with anything else. If you think you can, give it a try. The cries should not have been "they ripped off J.D." but instead "J.D. was so clever, you can't improve on it, even if you start with a clean sheet of paper."

The guys at AAC started from scratch, worked the details for all they were worth, and produced the .300 AAC Blackout. As this was going on, they were being bought, and the resulting work had a serendipitous outcome; since Remington was now a fellow-organization in the overall company, they simply (or at least, as simply as these things can happen) had Remington apply to SAAMI for cartridge recognition. Remington makes the ammo to the specs

as laid down before the SAAMI acceptance board. AAC makes the uppers and rifles, and everyone is happy.

That said, there are dimensional differences between the .300 AAC Blackout and the .300 Whisper. They are, however, quite minor, and you could use reloading dies for either with the other and not notice a thing. As long as the dies are adjusted to work in your rifle you will be fine. In fact, rifle makers who are not in one or another camp will in many cases mark their products as being able to use both cartridges interchangeably. However, if you have fine-tuned your loading dies to work with any and all .300 brass that happens by, you may find that your ammo may not work in other shooters rifles. If you are in the habit of swapping ammo with other shooters, that could be a problem. If not, you're good to go. Ideally, if you are going to have both in inventory, you'd use Whisper dies with Whisper brass, and feed them through your Whisper rifle, and ditto for the .300 AAC Blackout.

Recoil? What recoil? The .300 in any guise is a low-shove round, and perfect for new deer hunters or those who have trouble with recoil.

As with Hornady, Remington has also compromised on the powders it uses so that either load will work in your rifle.

Testing

I have two rifles and two extra uppers with which to test the ammo. One rifle was built by me using a barrel from J.D. Jones and chambered in .300 Whisper. The other is a complete rifle from S&W, their M&P15 in .300 Whisper, and done up in the latest camo finish for hunters. The first upper comes from CMMG, chambered in .300 AAC Blackout, and the second upper is an AAC product, chambered in (what else?) .300 AAC Blackout.

The SSK barrel is 16” long, medium weight, stainless steel and has a two-position gas block, for supersonic and subsonic loads. The twist is one turn in 7.5”, a common twist in this application. It came with a bare muzzle, which is fine if you are simply plinking, as the Whisper has absolutely no chance whatsoever of producing muzzle flash unless you put it through a barrel more appropriate for a handgun, say six or seven inches. However, I like flash hiders on my rifles, I don’t live in California and I can have them. I can also have suppressors, so I had Surefire send me a suppressor adapter/flash hider, and when my .30 can makes it through the paperwork song and dance routine, I’ll be able to install it.

I had a spare Stag upper on the shelf so, with the SSK barrel, I installed an Vltor CASV-MT handguard, as I find I like the light weight and the contours of the tube fit my hands. However, in order to access the two-position gas block, I had to drill through the top rail of the CASV-MT. Once that was done and I did a little trimming inside the Vltor handguard to clear the argument between the gas block and internal stiffening ribs of the Vltor handguard, things went together like strawberry jam and peanut butter in a sandwich.

The lower is one JP Enterprises sent as a test drone, and had John Paul’s excellent trigger already installed. So I simply slapped the Stag-uppered SSK barrel top half onto the JP lower and went to work. While I was testing the setup, Hi-Lux sent me one of their 1-

4X scopes, and since the .300 Whisper is not at all a long-range cartridge, a 1-4X with a wide field of view is very useful. And it was. In a LaRue mount, it goes on or off quickly, and if I need to I can change to iron sights easily.

It was with this setup that I ran into the first unusual situation with the Whisper, one I should have remembered from watching Ned on the back range of Second Chance: point of impact. The Hornady 110s and 208s did not hit near each other, except on the 25-yard zero target. The trajectories are so different that you really have to know which your rifle is zeroed for, and where it is zeroed. With a 5.56 rifle you can establish a 25-yard zero, refine it at 100, and be ready to go with any bullet or load (at least for people-shooting) out to 300 yards. With the Whisper, you can be a foot apart in point of impact at 100 yards. Just keep that in mind.

The S&W M&P15 comes in one of the latest camo patterns: RealTree APG. Well, the upper, lower and pistolgrip are done in RealTree, the barrel and stock are not. Interestingly, the lower of the M&P15 in .300 Whisper has the triggerguard as an integral part of the lower, not the winter triggerguard of the mil-spec models.

The barrel is medium-weight and has a twist of 1/7.5. That's to stabilize the heavyweights while not over-spinning the lighter bullets. The M&P15 receiver is a flat-top upper, but rather than install yet another optic, I simply bolted on Midwest Industries folding iron sights. The result is a handy carbine that weighs a bit less than six and a half pounds, less than a Winchester 94 saddle ring carbine in .30-30. With a five-round magazine, it is the handiest thing to hunt with, and you can hunt with it everywhere. Well, almost everywhere; Pennsylvania is off-limits, as they don't allow you to hunt with a self-loading rifle, the buzzkills.

The .300 conversion is so low-profile that you can't tell (this is the CMMG .300) unless you look at the barrel markings.

Where I did accuracy testing with the SSK-barreled upper at 100 yards (due to the optics) I limited myself to 50 yards with the iron sights on the S&W.

Uppers

The CMMG .300 Blackout upper is available in either a free-float handguard or an M4 handguard. The free-float model comes without sights, while the M4 has the front sight. (It has to, that's where the gas system starts.) Barrels are sixteen inches long with a 1/8 twist. The muzzle is threaded 5/8" X 24, the standard .30 AR muzzle threading, so you can put any .30 caliber flash hider (but not a .223/5.56 one) on the end. Or, you can install a flash-hider/suppressor adapter, if you wish. If you have all the parts you need, then CMMG can simply ship you a barrel, to be assembled at your end into a working upper or carbine.

The upper CMMG sent differs from the items shown on their web page, in that the one sent me has the M4-type front sight, "F" marked for the correct height to use a BUIS with, but an aluminum free-float handguard. The handguard, as a non-railed, is a very slim tube with stabilizing tabs on it to keep it properly oriented with the upper. They shipped it to me with soft rubber panels on it, but it would be a simple matter to unbolt the panels, bolt on rails where-

needed, and if you really had to have the rubber, trim them and bolt them back on. Even with the rubber panels, the handguard is very slim, and with gloves on it does not become this sewer-pipe sized object (as so many railed handguards feel like) you are trying to hold on to.

The CMMG offers their .300 AAC Blackout uppers in two gas systems: the pistol or carbine-length system. The carbine is the same as your basic AR-15/M4, and it is meant for the supersonic loads. You may or may not be able to get subsonic loads to work with the carbine setup, as gas pressure has dropped markedly by the time the bullet gets to the gas port in a carbine design. At least, .300 gas pressure. Conversely, if you opt for the pistol-length gas system, your supersonic loads may work the system excessively hard, what with the extra gas pressure provided by the supersonic loadings. Even more so if you use supersonic loads in a pistol gas-length setup and put a suppressor on the end.

CMMG puts a chart on the web page, next to each of the .300 AAC Blackout uppers pages, so you can keep track of this.

I would opt for the pistol-length gas system only if I was going to use the upper solely for subsonic loads, and mostly with a suppressor attached. Otherwise, I'd go for the carbine-length system hands-down.

CMMG also treats their barrels with a proprietary treatment that increases hardness and wear- and corrosion-resistance. The acronym WASP indicates that this particular barrel has been given the treatment. There is a lot of research going on these days, looking for something to replace hard-chrome plating the bore of a rifle. WASP is one approach, and so far appears to be a good one.

AAC, Advanced Armament Corp., sent an upper built with one of their barrels and with the superb Knight's railed URX-II handguard system on it. The URX-II sent is a mid-length, which combined with a carbine-length barrel creates a nicely-balanced look to an AR. (And we all know that looks are the most important thing, right?) The URX-II also has a front sight on it. If you didn't know it was

there you might not get around to using it. So well-hidden is it that I would not be surprised to see someone with a URX-II installed on their rifle and a flip up front sight bolted to the rail. You see, the URX front sight looks like it is just another section of rail. Press the lock button, and you can pivot the sight up. It isn't spring-loaded, perhaps the one trick Knight's missed here. Probably something the end-users didn't want. In re-reading this, I realized that asking why the front sight isn't spring-loaded is kind of like asking why the latest Lamborghini doesn't have cup holders. Once up, the sight locks in the up position, and you need to press the locking button to unlock it and fold it down. The front sight assembly also has a knurled wheel in it, for elevation adjustments. As convenient as it is, it is something I'd definitely paint in, to mark the zero location.

In consulting the Knight's catalog and web page, I notice that the URX II is listed as a Knight's part, but you cannot order it from the web page. Hmm. AAC lays hands on a part the Knight's reserves for their own builds. I can see this upper hanging around Gun Abuse Central for some time.

The barrel is a middleweight profile, although with the .30 hole down the middle instead of a .22, it weighs less than a regular AR of that profile, and it is made with a twist of 1/7, just a bit faster than the others. It also had the AAC fast-attach flash hider, which can accept one of their suppressors. Alas, the time constraints of this book precluded acquiring a suppressor to test on the upper. (We will have to address suppressors in Volume 5, I think.)

The flat-top upper is AAC marked, and the carrier (parkerized) has a logo on it. All the upper needs is a rear sight or optics, and a lower to park it on.

Ballistic Gelatin

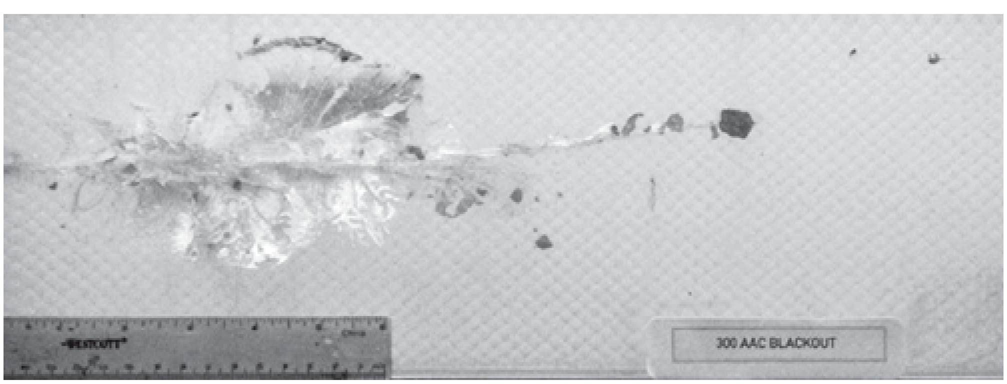
This was the really fun part, as I got to use handgun-sized blocks, and not the "chunks of the pyramids" rifle-sized blocks. Rifles usually require the 8X8X36" blocks, and even then they have to be tied down. If we try to use the handgun blocks (6X6X16) the rifles

usually explode them, throwing chunks of ballistic gelatin across the range. Or, they leap off of the table so much that they thrash themselves to pieces in the dust, dirt and gravel of the range floor, making it really tough to do a proper autopsy.

The report and recoil from any of these loads is mild, to say the least. The lighter bullets are snappier, and would make excellent deer-hunting loads for those who want to use the modern sporting rifle come November. A 110 grain to 125 grain bullet, designed for deer, at the velocities these rifles can produce, is plenty good enough to slay any whitetail that has ever walked the planet.

With a zero of an inch and a half high at 100 yards, you're going to be within an inch and a half of point of aim out to 200, which is essentially point-blank zero for most deer hunting. In the hands of a new shooter, posted in a blind with clear instructions as to what is "too far," you can count on the rifle doing its job.

Slapping the lightweights into ballistic gelatin produces the usual results; you get an expanded or fragmented bullet, a foot of penetration and impressively shredded gelatin. If you have a deer-hunting bullet that you prefer, and you know it works the way you want in the velocity ranges the .300s can produce, load it and have a blast. Just be sure to shoot enough to be sure it feeds reliably in your rifle. It would be a real shame to load up a big batch only to find it doesn't feed all that well. If your gun club won't let you shoot rounds from the magazine (I've heard of such places, but I would never join a club that was so Neanderthal.), you may just have to find a place where you can.



A 110 grain to 125 grain bullet, designed for deer, at the velocities these rifles can produce, is plenty good enough to slay any whitetail that has ever walked the planet.

The subsonic ammunition is what is really interesting. At subsonic velocities, the bullets are far too tough to expand, fragment or otherwise deform. They may as well be lathe-turned solids as far as what the speed and gelatin can combine to do. As a result, and due to the inability to spin the bullets fast enough (you'd have to have a rifling twist so quick you couldn't force the bullets down the bore, to stabilize them in gelatin) the bullets swap end-for-end. As they overturn, they begin to veer off the axis of impact. In some cases (especially the 208 grain A-Max in .300 Whisper), they will swap ends twice, and those all try to exit the sides of the gel blocks at the twenty-inch depth.

On one hand, a 200 grain bullet going subsonic isn't much more on paper than a .45 ACP, but that bullet going sideways is going to leave a mark. Just as an aside, there is a category of competition in USPSA matches that some clubs allow: Pistol Caliber Carbine. The match entry is for rifles chambered in pistol calibers, typically 9mm or .45, and you shoot the same stages and course as the handgun shooters do. The typical shooter will be running an AR in 9mm, on the same cardboard and steel targets as the handgun shooters. It is not unusual for a "C' class handgun shooter, hosing a course with a 9mm AR, to post times and scores that an "A" class Open shooter would be happy with.

Well, a bit of quick testing shows me that the heavyweight subsonic loads are not abusive to falling steel plates or poppers. They are right on par with .38 Super major, or .45 ACP loads, and don't cause dents or craters. (Now, if your club uses cheap steel, you may have a problem, but then you'll have a problem the first time someone shows up with a .38 Super at Major, running 125 grain bullets.) Plus, you could even load your own to create special match loads; a 150 grain softpoint or fmj (whatever is cheapest) at about 900 fps, which with the right powder would run your .300 just fine.

As reliable as a properly-tuned 9mm AR can be, the .300 is going to be more reliable, and you also have the muscle memory of the same-sized magazines to handle as you'd be doing in the club match later that month: 3-gun.

Bill Wilson

Okay, you all know Bill Wilson, right? Premier 1911 pistolsmith, competitor, inventor and purveyor of primo 1911 custom guns and parts for same. Well, in due time Bill decided to semi-retire, and he moved from the business in Berryville, Arkansas, to a place even more wild and remote. And there he found that his little piece of paradise was afflicted with the same ailment that so many places now suffer: hogs. Members of the porcine family are in many ways like people; they are smart, adaptable, omnivorous and family-oriented. For a while, it was a common business practice for ranches to import big pigs, feral hogs and non-native (well, they are all non-native to the Americas, but here we mean non-native in a 20th-century sense) species for hunting preserves.

Pigs escape, hunting preserves go out of business, and the pigs from regular pig ranches have escapees as well. Stir them all together and mix in modern agribusiness and what do you get? A burgeoning population of pigs. In some locales they are so numerous that they are not just annoyances to farmers, but real financial hazards.

Bill soon finds that his location is one subject to regular rapacious attention from the piggish set.

The first thought for most of us would be, "What 1911 works best here?" Alas, none. Since they have already been shot at, repeatedly, the pigs are often nocturnal and travel in packs. You do not go out in the darkness after "the pig" with just a handgun when there can be a family of tuskers waiting in the wings to stomp, tusk and thrash you. You may not come back. Bill starts with one of his custom AR-15s, but finds that while 5.56 is good enough in a military context, it is not so good when you're trying to smack all of a group. So he

looks at the .300. At that time, the Whisper, as the Blackout was still being developed.

What he found was useful but not the best for his needs. He had no need whatsoever for subsonic loads. Since the feral hogs he was shooting were not game animals, they were not covered by, nor protected by, the DNR regs he had to work under. So he could use a suppressor and even night-vision optics to shoot them. (If you think that sounds like more fun that should be allowed, and really want to have a go at it, welcome to the club.)

With a “can,” the subsonic loads become less important. But the supersonic loads were not all they could be. So, bill changed the cartridge. He kept the maximum overall length, he had to. But since he was going with bullets on the lighter end, the 110 and 125 grain hunting bullets, he could move the shoulder forward to better hold those bullets and also to gain case capacity. Where a 110 grain bullet in the Whisper/Blackout can be going right around 2300 fps, the 7.62X40 Wilson can boost that same bullet to nearly 2400 fps out of a 16” barrel, and over 2500 fps out of a 20” barrel.

As with the Whisper/Blackout, you can make your brass from cut down .223/5.56 empties. You can’t just neck up the .221 Fireball, as it is too short, but that isn’t really an option for a lot of people. Since the various .300s have been unveiled, .300 Whisper and .300 Blackout brass are both far more common than .221 Fireball ever was. Or, you just buy ammo and dies from Wilson Combat and follow the loading data they have generated for your use.

Now, the 7.62X40 Wilson, just like the Whisper and Blackout, can be yours simply by replacing the barrel from a .223/5.56 rifle. And, as you’d expect, Wilson Combat offers a host of barrel options for your shooting pleasure. However, there is one slight hitch in the situation; magazines. You see, when Bill decided to move the shoulder forward, he ran into (literally) the forward vertical stiffening rib in the AR magazine. Now, if you are just working up loads and aren’t planning on wholesale harvesting of porkers by moonlight, an occasional malfunction in standard magazines is no big deal. The Wilson folks tell me that, using standard magazines,

you'll lose a couple of rounds of capacity due to the uneven stacking and the crowded bullet tips being pinched in towards the centerline.

Cor-Bon makes superb hunting loads, and if you need something for defense this would be a good one to choose.

On USGI magazines, removing the stiffening rib pretty much destroys the structural integrity of the magazine tube. And once again in the modern era, polymer comes to the rescue. Wilson teamed up with Lancer to produce a version of the new L5 magazine just for the 7.62X40. What they did was simple; they removed the stiffening/feed guide rib on the inside that caused the problems. You can get a full 20 rounds into a 20-round 7.62X40 marked magazine.

Hornady has been making .300 Whisper for a long time, but now they offer it as a factory-brand.

Now, just because Bill Wilson didn't intend for his cartridge to be used in the subsonic role doesn't mean you can't make it do that. If you have a 7.62X40 Wilson and you want to shoot subsonic, you can do it, but it won't be as easy as the others. The neck/shoulder location on the case will make seating heavy bullets problematic and, since the barrel is meant for supersonic and the gas port drilled to a size for that, you may find it tough to find a powder to run the gun reliably, subsonic. This will only be made more difficult if you eschew the use of heavyweights for subsonic work, and try to make USPSA pepper-popper-safe loads with 125 grain bullets.

Shooters being shooters, someone out there is going to try, and succeed.

As I mentioned, Wilson has dies, and you can't use the other .300s dies to reload the Wilson, nor vice-versa.

The extra velocity does not come without a price. You'll have a bit more recoil, and you will have to use a smidge more powder to make those velocities, but that is it. And, if you are in a locale where the .223/5.56 is not approved for hunting, you can hunt with your AR.

Ammunition

To start with, we have the original: SSK industries. J.D. Jones makes some loads that are not just specialized, but work in ways that you have to scratch your head over. Are these meant for use against platinum-plated space squids, when our alien overlords send in their interplanetary jannisaries to enforce their edicts? I mean, subsonic, pre-fragmented loads, saboted penetrators, expanding bullets (a neat trick with subsonic loads) and more. If you need ammo a bit more standard, you can go to Cor-Bon, who make and have made .300 Whisper for many years. They can offer you a 125 grain and a 220 grain self-defense loads, as well as a 150 grain hunting load.

The big news that started a lot of this is the Hornady line. Big Red offers two loads: their 110 V-Max bullet in a supersonic loading, and the 208 grain A-Max subsonic. The V-Max performs as you'd expect; penetration and fragmentation, and would be a good choice on whitetail as long as you aren't trying to bust them through the shoulder. The 208 A-Max is for having fun and removing sentries. Okay, not much of that these days, at least not stateside, so it is the quietest, funnest load Hornady makes.

When Remington makes something, you know you can get lots and lots of it.

Starting with the 220 grain subsonic, Remington now makes a 115 grain UMC load for practice and plinking.

In .300 Blackout, Remington loads a 115 grain fmj, your basic plinking load and 7.62X39 equivalent, as well as a 155 open-tip match and a subsonic 220 open-tip match bullet.

For the 7.62X40, Wilson combat is loading 110 and 125 grain bullets.

Of course, if you do your own reloading you can use any bullet that will fit the case and the magazine and feed properly. I'd suggest you pay close attention to the existing loading data, as the small case is not very forgiving of "experimental" reloading.

.300 AAC BLACKOUT

The Remington 220 grain subsonic load, a suppressor and a range, and you have a real fun day.

The AAC upper arrived with a not-easy-to-acquire Knight's Armament URXII railed forearm.

The Advanced Armament Company has been making suppressors for some time now. In the process, they had to learn a whole lot about how rifles work. You see, simply hanging a "can" on the muzzle can do a lot to change the gas flow dynamics of a system. You keep the pressure higher, longer than the system was designed for, and that can cause difficulties.

The big one for 5.56 users is that a whole lot more gas than normal gets pumped back through the gas tube. So much so that the receiver can have the lube cooked or blasted, and a lot more powder fouling/soot builds up.

So when it came time to design a cartridge and build an upper to house it, they knew a thing or two about the job.

The cartridge is the .300 AAC Blackout, aka 7.62X35, made and loaded for them by Remington. It is an AR-magazine-length .30 caliber round that fits an unmodified 5.56 bolt, and as such the only real modification you need to make to your AR (or a new upper for it) is a replacement barrel. And while plugging new barrels into existing ARs can be fun, the real fun is in seeing what a maker decides they want in their own-built upper or rifle.

In order to make the deadline for this volume, I could not lay hands on a complete rifle. I was competing with every other writer out there, and a slew of paying customers as well. What complicated things further was that the majority of the customers wanted an sbr, a short-barreled version, either upper or complete rifle. My home state does not feel that its subjects are to be trusted with such nefarious objects as short-barreled rifles, so I had to wait until AAC did a short run of carbine-length uppers. (I still have this nagging suspicion that they built the run of uppers just to get one to me. If so, thanks guys.)

The 1/7 twist barrel is of medium weight (you really can't make a lightweight, or pencil-barrel AR barrel, and do so with a .308" bore in it) and the 4150 steel alloy is black nitrided inside and out. The muzzle is threaded for the standard .308" bore AR threads: 5/8-24, so you can use any flash hider that would work on an AR-10 or other big-bore self-loading rifle. The one sent to me has the AAC Blackout® flash hider and combo suppressor mount on the end. The Blackout® is built to be a very effective flash hider, while also allowing a quick-attach system for the most-excellent AAC suppressors. As if that wasn't enough, AAC makes the Blackout out of an unspecified aerospace alloy, to withstand the hard work of muzzle blast and the vibration of a suppressor in the end.

The front sight has an easy-to-adjust elevation wheel.

Just so you can see it from either side, the upper is marked AAC.

Their excellent flash hider and suppressor mount, the AAC Blackout.

The barrel is plugged into a flat-top upper from Keyhole Forge, and marked on both sides with the lineage. One side is just "AAC" while the other side has "300 AAC BLACKOUT (7.62X35) ADVANCED ARMAMENT COMPANY" on it. Inside is a parkerized carrier and bolt, with a standard 5.56 bolt face.

The handguards are where things get really interesting. Since the rest of the exterior is (as our British cousins phrase it) bog-standard, you could put any handguards you wanted on the .300 AAC Blackout upper. And I'm sure there are those who will insist on installing what they feel are the perfect handguards. But this upper came with the perfect handguards already in place.

It came with a Knight's Armament URX II Mid-length forearm in place. Woo-hoo! While railed forearms can be a bit bulky (some can even be described as "porky"), the Knights are among the slimmer ones. And even with the rail covers in place, it is not too bulky until you start shooting with winter gloves on.

The AAC upper (and rifles, when they are in stores) comes with the upper AAC-marked.

The front sight is hinged, and you only need to press the button.

The really cool part of the Knight's URX (besides being hard to obtain, and the same company that provides many of our high-speed low-drag military units) is the front sight. What, you don't see a front sight on it? That's because it folds down. And when folded, it appears to be just another section of the upper rail. Really, it is so low-profile that if you didn't tell someone there was a sight there, they might mount a light or laser over it. And as a final bit of coolness, the Knight's sight has its own thumbwheel elevation. Best to zero it and paint-mark it, in case one of your buddies decides to play with it in a moment of boredom.

The AAC upper fit just fine on a cross-section of my rifles and lowers, so I didn't have to dedicate it to any one of them. The feeding was flawless, and the ammo I had (at this time, I can only lay hands on the subsonic, 220 grain open-top match load) worked without fail.

With a 1/7 twist, the AAC barrel does its best to stabilize the long, heavy bullets it may see. That they are not stable in the target is a good thing.

Accuracy was top-notch, and you would not have any problems tagging a deer in typical woods distances, or a sentry at “across the clearing in the moonlight” distances. Actually, the 220 grain subsonic load is a lot more accurate than just across the clearing, but the trajectory is quite a bit to deal with. If you really are planning to use it at more than 25 yards distance, you would be well-served to find a ballistics program, calculate the trajectory, check it at the range, and keep a printout with you when you are loaded.

One thing I liked about the AAC upper was that it came with an owner’s manual. The corrective actions pages are good, as they tell you correctly that most of the problems are solved by unloading, cleaning and lubing your rifle. However, they still instruct the reader that the gas rings have to be turned so the gaps don’t line up, or the rifle will short-stroke. Alas, this is not the case, but it is very difficult to get such things out of the collective consciousness, once they get lodged there.

And for those who can have them, an SBR .300 Blackout and a suppressor make a range trip oh-so-fun.

But the rest is good info, and the upper is primo. I just wish they wouldn't use an SBR as the demo rifle in the photos. Each time I see it, I have to fight back the urge to consider moving to a friendlier State.

Test-firing

The ammo I had available that was real-deal, honest-to-god .300 AAC Blackout was Remington 220 OTM subsonic. However, the chambers are close enough that I had to test, because I know you guys will. I had on hand Hornady .300 Whisper and Cor-Bon .300 Whisper ammo. In the Hornady, I had the 110 V-Max and the 208 A-Max loads, and from Cor-Bon I had 125 JHP self-defense rounds.

They all worked just fine. The velocities they delivered were right in line with other rifles of the same barrel length, and the groups were on the point of aim and as good as you'd expect from top-notch ammo makers.

I think what we're going to see from the short .300s in the future is a lot of reloading experimentation going on. Everyone out there with one or the other is going to load up, test, report and advocate their loads.

As long as you're using an upper or rifle as top-quality as this one, you won't get bad results.

For accuracy testing, the Hi-Lux 1-4X24 is a fast scope, and suited to the CQB-to-100-yards use most .300 Blackout rifles will get.

FAR LEFT: If you want to hunt, you can use Whisper ammo like this Cor-bon load in your .300 AAC Blackout.

LEFT: The Remington 220 grain subsonic load, a suppressor and a range, and you have a real fun day.

.300 WHISPER

The Whisper is as accurate as you are, and probably more accurate than most shooting it.

Hornady came out with it in two loads, a 110 and a 208. Supersonic or subsonic, your choice.

There is one thing you can say with certainty about the AR and the .223/5.56 round it is commonly chambered in: it is loud. As in ear-busting, hearing-damaging, you-gotta-wear-earmuffs loud. What if I told you that you could change one thing and make it only handgun loud? And if you live in a state where suppressors are allowed, make it almost as quiet as the rifles in the movies?

You'd probably ask, "What new thing is this?" It is not new, even for the source of ammo: Hornady .300 Whisper®. The Whisper comes from the fertile mind of J.D. Jones. The original idea, and the building blocks of the Whisper family (he offers similar cases up to impossibly-large cartridges) are simple: launch a very heavy subsonic bullet to eliminate enemy sentries, a bullet heavy enough so that even though it is subsonic it hits hard, and do all this from an AR as unaltered as possible. The parent case, the .223/5.56, is out. By the time you have opened the neck up to hold a big, fat bullet, the bullet nose sits so far back in the case you can't get it to stay in place. So he looked elsewhere. The case he lit upon is the .221 Fireball. The original loads he worked up featured the heaviest .308" bullets to be had then: 220 grains. The resultant combo, once J.D. had worked out the details, fed from unaltered magazines, and the only different part you needed was the barrel.

Today, you no longer need to make your own brass (you could buy brass, but many made their own from .221 or .223) and then load up, you can now buy it right from Hornady already loaded. They are offering two loads to start with, one is a 110 grain V-Max, and the other a 208 grain A-Max bullet. The 110 grain bullet is listed at 2375 fps out of a sixteen-inch barrel, and the 208 A-Max at 1020 fps out of the same. And they are here now.

The big secret for the longest time was that Hornady was making the ammo and the brass that J.D. Jones was loading for .300 Whisper. He and Hornady agreed to bring it out into the daylight and, in combination with the S&W M&P15 in .300 Whisper, make a ready-to-go combo that every gun shop could stock or order. No need to custom-order it from SSK Industries. Oh, you still can, but with increased commercial availability a lot more shooters can own

one, and the shop guys at SSK can focus on the true custom guns.

The easy thing about a .300 Whisper conversion: a new barrel. If you have an AR with a shot-out bore, you can have a Whisper for the cost of a replacement barrel. Almost every other caliber requires more than that.

The best part is this: if you have any experience or ability working on guns, you can make one. The only thing that differs between a .223/5.56 and a .300 Whisper is the barrel. Order a .300 Whisper barrel and you can plug it into an AR upper. That's what I did.

J.D. grabbed a barrel off the shelf and together with some sample ammo he makes (much more specialized than most shooters need) he packed and shipped it to me right away, the barrel arriving mere hours after the ammo had.

Now, a lot of people have been doing the .300 Whisper on their own but not calling it a .300 Whisper (which is a trademark name). After all, if somebody had a lathe and chambering reamers they could easily craft a barrel to fit an AR. What lots of them have not done, and which SSK did on this upper, is provide a gas block that allows switching to the correct gas setting for your load and use. Plus, when someone orders a reamer, often as not, they have a

“better’ idea than the originator. So, a lot of “.300-.221” rifles out there won’t work well with .300 Whisper ammo. Plus, the port pressure (and by extension, required port diameters) in the four uses are quite different. Four uses? Yes: supersonic loads, open and suppressed, and subsonic loads, open and suppressed. At one end is supersonic and suppressor on it, where the port pressure and dwell time are at their greatest. At the other extreme, a subsonic load and a non-suppressed rifle, a situation where the rifle has much less gas to work with. Get the port too small and you short-stroke with subsonics. Get it too big, and you hammer the rifle with supersonics and a can.

J.D. had warned me that the adjustable gas block he fits to his barrels was just a smidge too big to fit under many railed handguards. Looking it over, I can see exactly how to shape it to fit many of them, but I took the easy way out. I plugged his barrel into a Stag flat-top upper I had on hand and slapped in a Stag bolt/carrier assembly. Over the barrel, I put an Vltor CAS-V handguard, as it provides plenty of room inside while still being trim on the outside. Even at that, I had to do a bit of trimming to make sure the gas block cleared one of the stiffening ribs of the Vltor handguard.

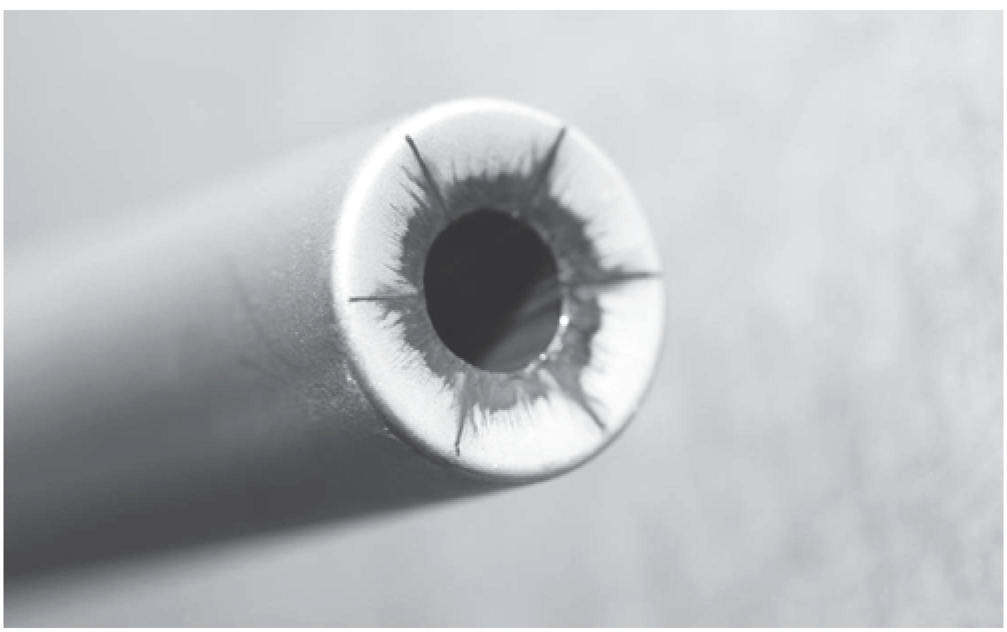
For optics I went with a scope recommended by Dave Fortier: Hi-Lux 1-4X-24 CMR, a compact scope he has used and found to work well. As the .300 Whisper is not exactly a long-range sniping cartridge, I didn’t feel the least bit hampered by a maximum of “4” power. The 1-4X CMR has a ranging reticle (although I have to wonder just how much it corresponds to the trajectory of the .300 Whisper) and a circle-dot illuminated center. For a fast and close scope, it has all the features you’d need without the wallet-busting price of many “name” scopes.

If you live someplace that does not permit a suppressor, there are only two of those gas-flow conditions to worry about. But I was still curious, and part of the testing was to see how the upper performed with each load, and each gas block setting. In talking with Hornady, my contact told me it wouldn’t be a big deal, they had worked to

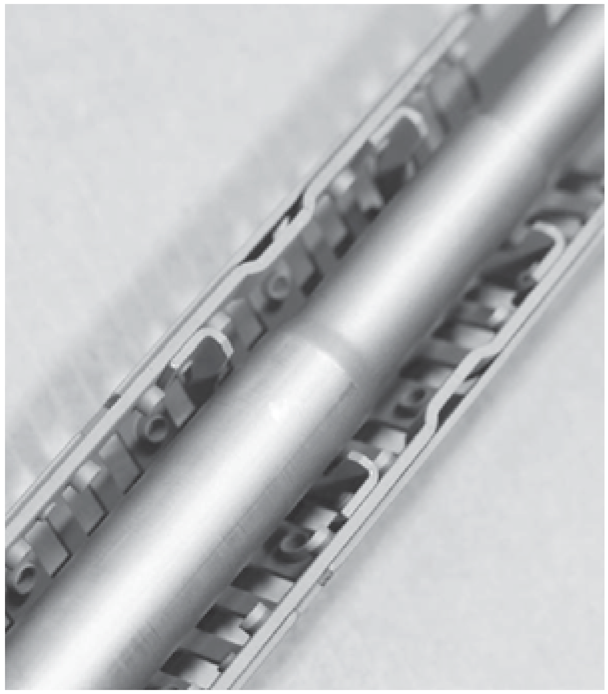
produce a pair of loads that would function correctly even at the extremes.

As soon as the upper was assembled I had to put it on a lower. The third one in my rack that I tried, a JP Enterprises forged lower with a JP-installed and tuned trigger in it, fit like a glove, so that was that. With all the ammo Hornady sent me, I was off to the range.

Now, the gas port selector is a disk on top of the gas block. To select which port size you get, you have to turn the disk one way or the other. In order to access the disk, I had to drill a hole in the top rail. This is just one of those things we have to do in the name of R&D. The Vltor handguard had no problems with the hole drilled in it and does not appear to be weakened in the slightest, but you really should consider a detail such as this when you go selecting a handguard for your build.



The SSK barrel is very well made. (Big surprise there.) The evenness of the powder residue on the crown is just one indication.

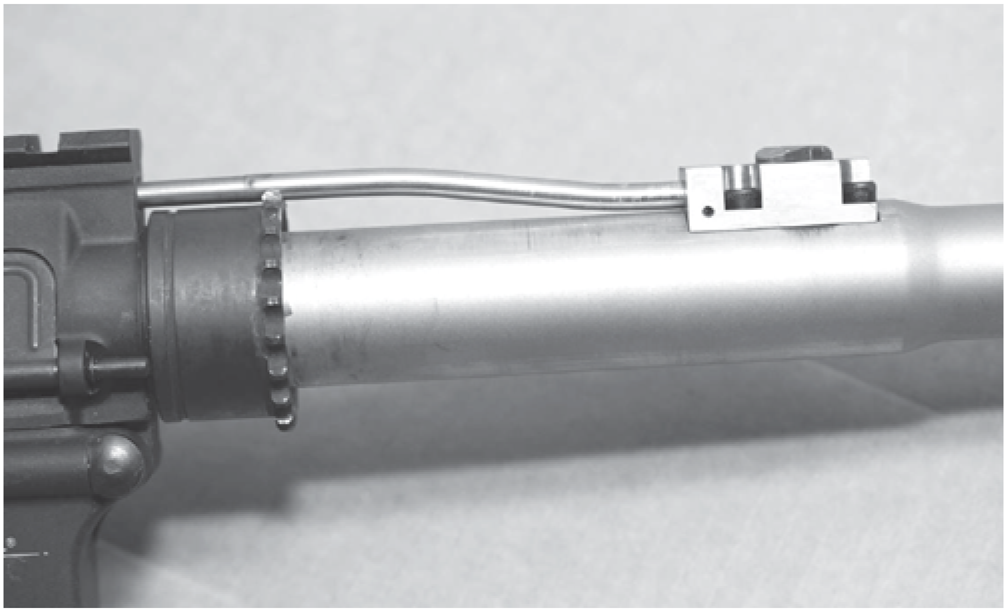


The SSK barrel fits the Vltor forearm well, except for some minor fitting to clear the gas block.

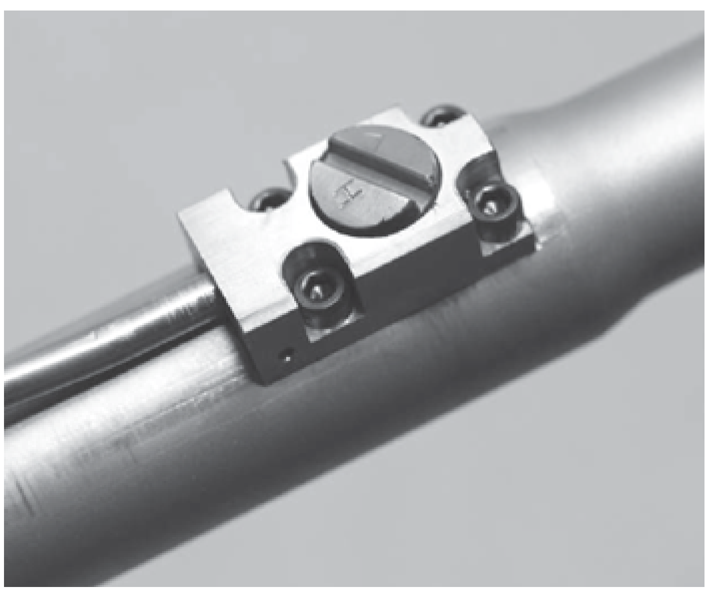
As my Hornady contact predicted, both loads cycled the rifle just fine with the gas port adjustment set to the supersonic/suppressed port, and while they both worked with the subsonic port, the brass was tossed further, indicating excess gas. And, as expected with ammo coming from Hornady, they are accurate. Of the two, the subsonic was more accurate. One detail that might explain the difference is recoil. Where the 110s at 2300 are mild in recoil, the 208s are even more mild. The 110s had a slightly (and it is not a large difference) snappier feel to the recoil, while the 208s were just pushier. Where they radically differ is trajectory. I started with the 110s and shot a 25 yard group to determine zero. I then adjusted it at 100 yards, getting close enough to the bull to keep my group on the Shoot-n-C target, just an inch low.

The 208s hit a bit more than a foot low at 100 yards. What is really impressive is velocity. While the 208s “only” left the muzzle at 923 fps (hey, they’re supposed to be subsonic, remember?) ballistic software indicates lost velocity at 100 yards to be a grand total of 23 fps.

Dialing the group up wasn't a problem, as the CMR has clearly marked and easy-to-change range knobs. The reticle is very interesting, and I look forward to trying it, on my Whisper, on the National Guard pop-ups in our next class.



The gas tube on the SSK barrel is handgun-system short, so it will have enough gas pressure to run the system even with heavy-bullet subsonic loads.



The gas block is adjustable for supersonic and subsonic loads.

Now, what if you aren't looking for a suppressed, heavy-hitting compact defensive rifle? That's just fine, as the AR-15 is the Modern Sporting Rifle, the equivalent of the 21st century lever-action deer rifle. A century ago, the idea of a lever-action, small-caliber (compared to the cartridges of the day, .30-30 is small) rifle as a regular hunting rifle was radical. Now, we take it for granted.

At first glance the two loads currently on hand from Hornady might not seem all that suited for deer. A 110 V-max is perhaps too fragile (and perhaps not) and a 208 subsonic A-Max is not going to expand. However, think in the middle. There is no lack of hunting-performance .308" bullets in the 110 to 125 grain range. A softpoint hunting bullet of 125 grains at a velocity of 2,200 fps is a cinch to develop a load for. A 125 at 2,200, zeroed two inches high at 100, is down a grand total of 2.8 inches at 200. And out there it still bests a factory .357 at the muzzle by more than 300 fps. Ammo? Hornady is already working on it. And, if you are going to go with factory ammo, the Hornady 110 V-Max load works. With the super-soft recoil, and stellar accuracy, it would not be too difficult to wait until the shot you need presents itself: behind the front leg, into the lungs, and the V-Max will do its job.

If you can't wait on Hornady for hunting-specific loads, then load your own. While the typical cartridge for the AR, the .223, can be a bit fussy to load, the .300 Whisper looks to be a cinch. Hornady already makes dies, and a quick check shows that the other die makers all have die sets in their catalogs too. The supply of accurate hunting bullets in .308" is seemingly inexhaustible, and if you just want to shoot, then surplus .308" pulled bullets can be found relatively easily. As for powder consumption, the .300 Whisper just sips. I didn't have time to do reloading, but a quick check for data shows powder charges from 12 to 20 grains, depending on bullet weight and desired performance. A good practice load, with 147 grain military surplus fmjs, would call for 15 grains of powder. Hard to get more economical than that, with a one-pound bottle of powder lasting you for just over 450 rounds. And surplus .308" fmj bullets are currently going for $109 per thousand rounds. At those

prices you can’t afford not to practice.

Once I had the rifle up and running it was easy to thread the muzzle and install a Surefire flash hider and suppressor mount.

I had to make a modification to the Vltor handguard to access the gas system adjustment setting. The Vltor handguard shrugged it off, no big deal.

And just so you won't get things mixed up, the Hornady ammo is headstamped to the Whisper caliber.

And with a hunting load of a 125 grain bullet at 2200 fps, you are ready for lots of range practice and a successful hunting season.

For those with a modicum of gunsmithing skill, it would be easy to build a compact AR to house it with, say, a slim 16" barrel, lightweight handguards and stock, and when done you'd have a rifle in the 6.5-pound weight range. Mine, with a medium-weight match

tube, runs six pounds fourteen ounces. Add a compact hunting scope and you'd be hard-pressed on a rifle with a more-slender barrel to push it much past seven pounds.

A just-over-seven pounds, .30 caliber (a bore size legal for deer everywhere rifles are allowed) scoped rifle, with a five-round magazine, sounds like a very useful hunting rifle to me. And the recoil isn't going to knock you out of the blind, either. With a 200 yard point-blank range, you are ready for a successful whitetail hunt, and with a modern rifle to boot. J.D. Jones, the man is a genius.

CMMG .300 BLACKOUT

The CMMG in .300 Blackout uses their barrels with their own super-hard surface treatment. You'll spend a lot of money on ammo before you wear out this barrel.

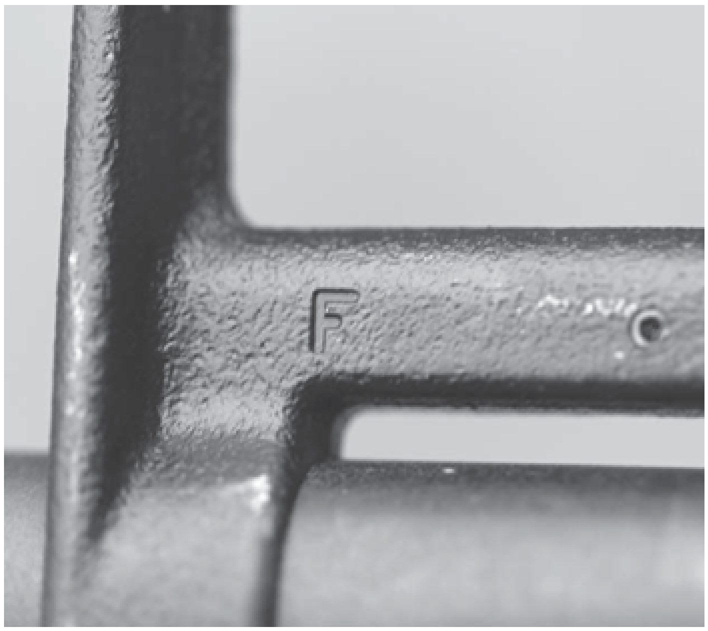
CMMG is a maker of ARs that, in my opinion, doesn't get enough respect. Elsewhere in this book you'll read of the horrifying abuses I heaped upon one of their rifles (along with others) and how it stood up as well as the best.

Here, we see one of their niche offerings, the .300 Blackout. Simply put, they provide a very nicely spec-ed upper with one of their barrels in it chambered in .300 Blackout. The barrel has been given their WASP surface-hardening treatment, and thus does not need to be hard-chromed.

The front sight forging is an "F" marked unit, so it will line up correctly with back up iron sights and not require the usual gymnastics when you have a maker who doesn't know about these

things. The flash hider is your basic A2, but since everyone out there has their own idea as to what is best, CMMG just puts the mil-spec closed-bottom birdcage on and leaves you to get and install “something better.”

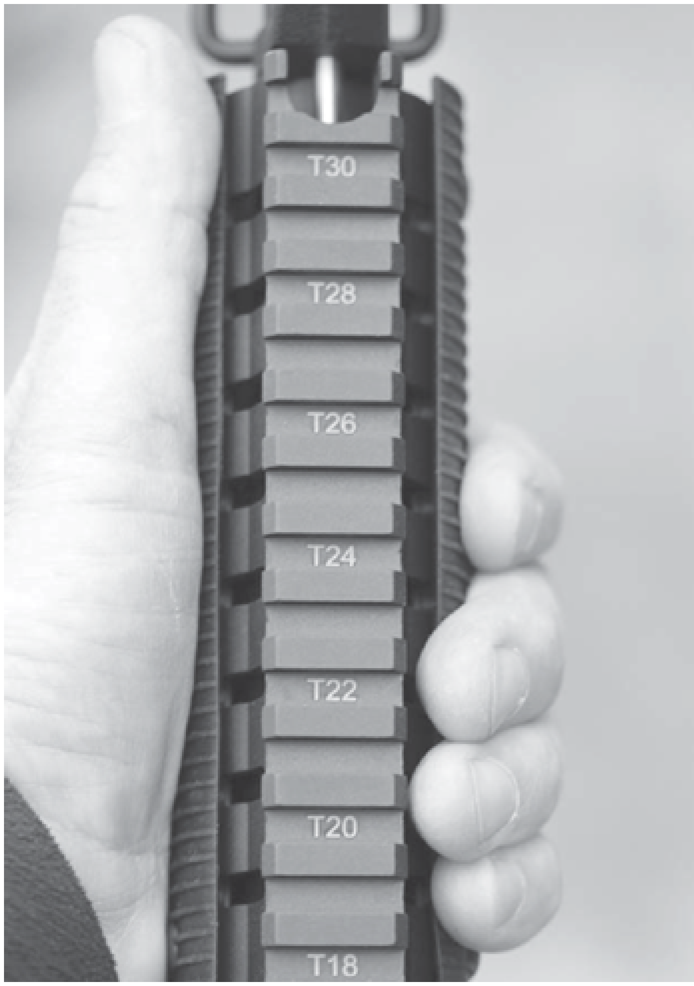
The flat-top upper is correct, and you can put on irons, optics, whatever fits or fits your fancy.



In case you were worried, the CMMG front sight is a proper “F” marked forging. That means all your BUIS options will work.

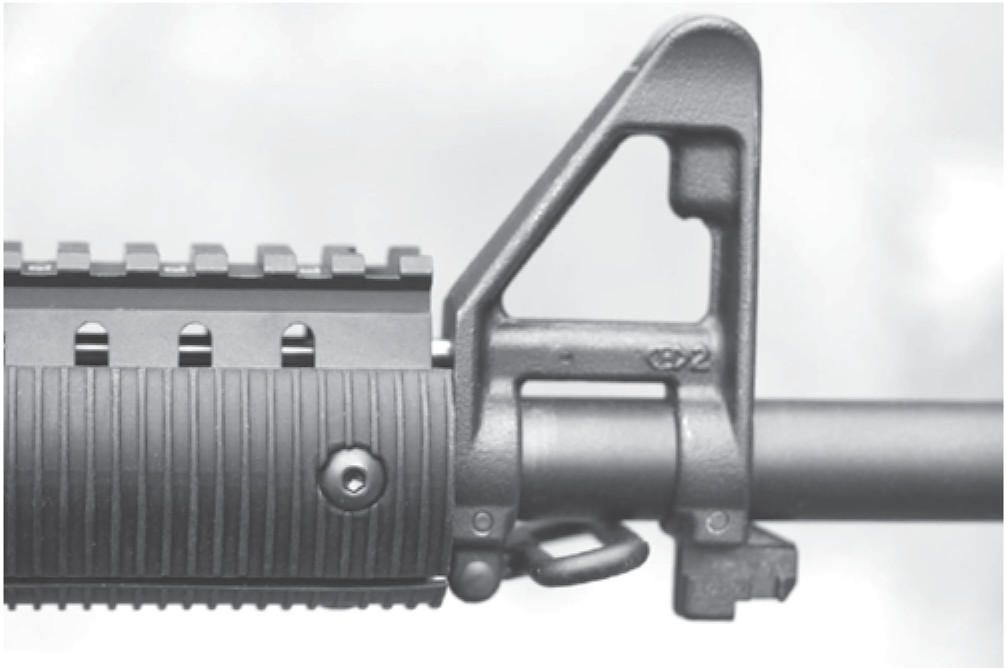
This upper arrived with a standard front sight forging.

From the exterior, you would not know it was a .300.

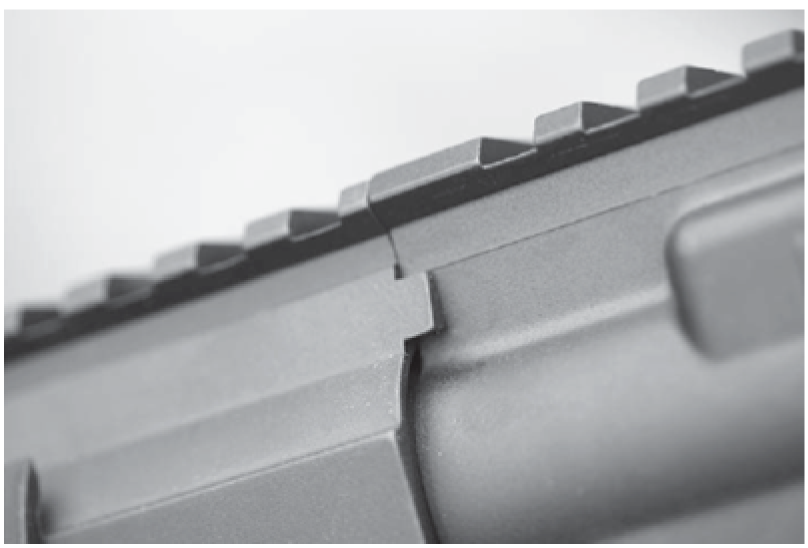


I have large hands, but I dislike large forearms on rifles. The CMMG is very trim.

A slim, round handguard, with the option of putting rail segments where you want. Very nice.



The very elegant handguard does not contact the front sight.



The CMMG handguards have side shoulders that prevent handguard rotation. A smart touch.

The handguard is very nice. It is, first of all, trim. It does not have an acre of rail estate on it, but instead has rubber covers. If you feel the need to have rails, you can modify the covers, remove them and/or install a section of rail to bolt on the laser, sight or coffee-maker you desire.

For not a lot of money, and fitting on any AR lower you have, the CMMG is one way to get into the .300 subsonic arena. The barrel twist is 1/8, which is a good choice. The handguards allow for personal options and even some experimentation. And, the handguard has small tabs on the rear that line up with the receiver, so the handguard will resist rotation. Oh, you could probably break them off if you're a weightlifter and get really adrenalized, but short of that, they'll keep your handguards in line.

To no great surprise, the CMMG upper worked flawlessly with all loads and all brands of .300 ammo.

If you want a .300 but you don't want the work of re-barreling an existing upper, then this is a very attractive way to go.

WILSON 7.62X40

Accuracy? You want Accuracy? Bill Wilson and the crew know how to deliver.

The Wilson Combat AR, chambered in 7.62X40.

The big criticism, besides the whole direct-gas "spews where it eats' complaint is that the AR has been viewed as under-gunned for anything more than small deer. Sure, potting Texas whitetails, who might be more than 75 pounds field-dressed, the AR and the 5.56 are not overly stressed. But shoot a Pennsylvania buck or a corn-fed Midwest buck with one? (And yes, I know that Pennsylvania hunters aren't allowed-self-loading rifles.) To some, it is seen as barely adequate for critters bigger an anemic, midnight garbage raiding raccoon. Not true, but when you start considering using ARs for really big, tough critters, you do have to move up from the typical .223/5.56 carbine.

Bill Wilson, of Wilson Combat fame, having made a name as an IPSC competitor, gunsmith and company founder and builder, decided he'd had enough. He turned the company over to his son and semi-retired to a locale further south than Berryville, Arkansas. Once settled in to the new digs, he discovered something horrible: the place was infested. Not with ghosts or zombies, but something worse: hogs. Big, rough, bad-tempered ham sandwiches on the hoof, tearing up the countryside and pushing out other game animals. He

was not alone in this, as feral hogs seem bent on taking over every locale not submerged in kudzu.

Some were escapees from pig farms, others escapees from hunting preserves that had brought in exotics, boars from Europe and other places. Some even from hunting preserves that went out of business, and the hogs, being hogs, simply kept on making hoglets and headaches.

Bill took his decades of knowledge of ballistics, and began with the resources of his top-notch custom firearms company to call on. His first look into the problem led him to the .300 Whisper, a cartridge invented by J. D. Jones. There, the basic case is a .221 Fireball, which is necked up to accept .308" bullets, and does so in an amazingly efficient manner. We've discussed this at length several places here in Volume 4. However, there were two details of the .300 Whisper that were obstacles to Bill.

The TRIM handguard has built-in QD sling sockets. It also has only the rail estate you want.

The rubber buttplate is not for recoil comfort, but a non-slip shoulder mount.

First, J.D. Jones designed and intended the Whisper to be a subsonic cartridge. That it is also capable of supersonic velocities is cool, but subsonic was the first and main goal. While a 220 grain .308” bullet at 1,000 fps is very quiet, it isn’t exactly what you’d want to use smacking porkers that are already in an ugly mood. I’ve seen photos of people who have bagged whitetails with subsonic loads, but there is a difference. Pigs are smart. They are, in an ironic, and to some unsettling, way, smarter than the dogs we keep as pets and companions. They know what the deal is soon after they start getting hunted. And they don’t like it, so it is not at all unusual for them to resist. Where deer will always run, hogs sometimes don’t. If they can they will, but if they can’t, they come for you. Under those circumstances, I’m not at all sure I’d be happy using subsonic loads.

Second, the magazines J.D. had to work with 30 years ago were USGI aluminum mags. He had to keep the case length and shoulder

strictly located or feeding suffered. He had no way to modify the mags.

The top rail lines up with the receiver, giving you a continuous rail from receiver rear to front sight. Lots of room for optics.

An easy-to use scope mounting locking nut. No need for a torque wrench, metric socket wrench, or who-knows-what.

As a lightweight hunting rifle, the 7.62X40 is a superlative tool.

Bill wasn't interested in subsonic performance. While I'm sure you could reverse-engineer the 7.62X40 to deliver it, and reloaders and experimenters will, Bill wanted only supersonic, and he wanted all the speed he could get. So, in designing it, he took bullets in the weights from 110 to 150 grains and loaded them as long as they would fit into the magazines. Then he pushed the case neck and shoulder forward until they were located to properly hold the bullets and provide as much case capacity as possible. Success! Without increasing pressures over that of similar cartridges (Whisper and Blackout), the extra capacity gave him more velocity. He could get more without overly stressing the system, as you would if you tried to gain velocity solely by increasing maximum average pressure. But it didn't come without a price.

Wilson Combat sent me a rifle with two uppers, a 16" with Bill's own Accu-Tac flash hider, and a plain-muzzle barrel of 20" length, both inside of the new Wilson Combat Tactical Rail Interface, Modular, or TRIM. The idea of a handguard that isn't always fat and railed is really catching on, and I like it. The TRIM is a slender handguard and is drilled and tapped for rail segments, so you can bolt on what you need, where you need it. The TRIM rail also has

built-in QD recessed sling swivel sockets, so if you prefer that style they're already there. As a bonus, and inducement to switch over to the recessed QD style, you don't have to bolt on a section of rail just to have a place to bolt your sling swivel.

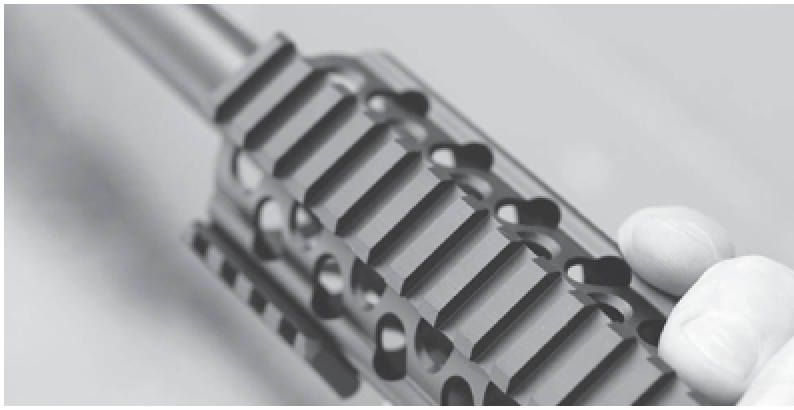
If you want a light or laser, use just enough rail, where you want, and life is good. You can even custom-shorten rails to met your exact needs. Neither of the uppers came with iron sights on them, instead Bill sent his new Accu-rizer scope mount. The single-piece scope mount has a three-lobed bolt on the side, by which you clamp it onto a flat-top upper.

The Wilson Combat forged lower has all the details of a mil-spec lower except for the subtly-sculpted winter triggerguard. The carbine stock is a Rogers Super-stoc™, which has not only a lever to unlock for adjustments, but an extra locking lever to make sure it doesn't wobble around on the tube on you.

Inside, the setup is all Wilson, from bolt and carrier to trigger components. Having a very nice trigger should not come as a big surprise. Bill Wilson is someone who knows a thing or two about trigger-pulling, and he spent a lot of time making sure the company knows how to make nice triggers.

The rifle also came with a pair of Lancer L5 magazines, marked as being 7.62X40-specific. Why? Simple: by designing the case with the neck and shoulder as far forward as possible, Bill was able to get more velocity. That same forward-shoulder design runs afoul of a rib inside of the magazine. That rib is there to control the cartridge stack (of .223 or 5.56 rounds) in recoil, and guide them in the feed path. It also acts to stiffen the magazine tube. To get the 7.62X40 rounds to properly stack and feed reliably, Bill had to remove that rib. On a USGI magazine, that would be a monumental hassle. You could have a magazine maker construct new stamping dies and create a tube lacking the rib. It might not be as strong as the USGI design, however. Or, you could remove the existing rib on magazine tubes and probably destroy the structural integrity of the aluminum tube. For Lancer, with their magazines made of tough polymer and with steel feed lips, it was no big deal. If you want more magazines,

Wilson Combat lists them, and they are a few dollars more than the un-modified magazines.



With just a top rail as permanent, the TRIM forearm is just that – trim.

Even a small hog is a big collection of ham sandwiches and BBQ ribs. They don't quit from ineffective hits.

Do you need the Lancer mags? Not if you're willing to settle for a few rounds less capacity, and perhaps the occasional feed problem.

Along with the rifle and extra upper, Bill sent me an embarrassingly large amount of ammo, unfired brass and loading dies. Again, this is not just a one-off project by someone with a

bright idea. Bill thought out all the details, has a company to back it up and we all benefit as a result.

In testing the rifle, I had a chance to use several different scopes. The three-lobed thumbwheel on the side of the Wilson mount makes it easy to put on or take off of the rifle. As far as the mount itself, it is a simple, if fussy, task to swap scopes. In that regard it is like all other scope mounts, and no one has found a way to make that task easier.

Even with ballistics that match or exceed the AK round, the Wilson 7.62X40 hardly pushes you on recoil. As far as hunting goes, it has ballistics on close par with the .30-30. Even in a lightweight rifle, the push of a 110 grain bullet at 2450 fps is not going to shove you off the shooting bench. Combine it with the straightline recoil of the AR design and the result is as fun-to-shoot rifle. That soft recoil means faster follow-up shots on a boar, or better yet, getting all of those in a group. And yes, Bill has done that, and tries to do it every time the opportunity arises.

Since in many jurisdictions wild hogs are not protected (far from it) you can hunt them, where the gear is legal, with suppressors and night-vision gear. Farmers with crops being ravaged by hogs will invite you over. Heck, if the problem is bad enough, they'll put you up, cook breakfast and even drive you out to the blind.

"That's great," you say, "but I don't hunt hogs, never had, and never plan to. I just want to have a good defensive rifle handy, and maybe hunt deer." You're in luck. The ballistics of the 7.62X40 are, as I've said, on-par with the .30-30, a cartridge no one has ever said was insufficient for two-legged predators. If anything, the Wilson 7.62 exceeds the actual specs of the Browning zenith of levergun design. And, being available from Wilson Combat, you can have factory-loaded ammo for the defense-ready mags, and still reload your own ammo for practice and hunting.

As far as trajectory goes, the 7.62X40 has it all over the .30-30, as it can use bullets with a much better ballistic coefficient. As an example, Wilson Combat did the calculations (and then testing) for

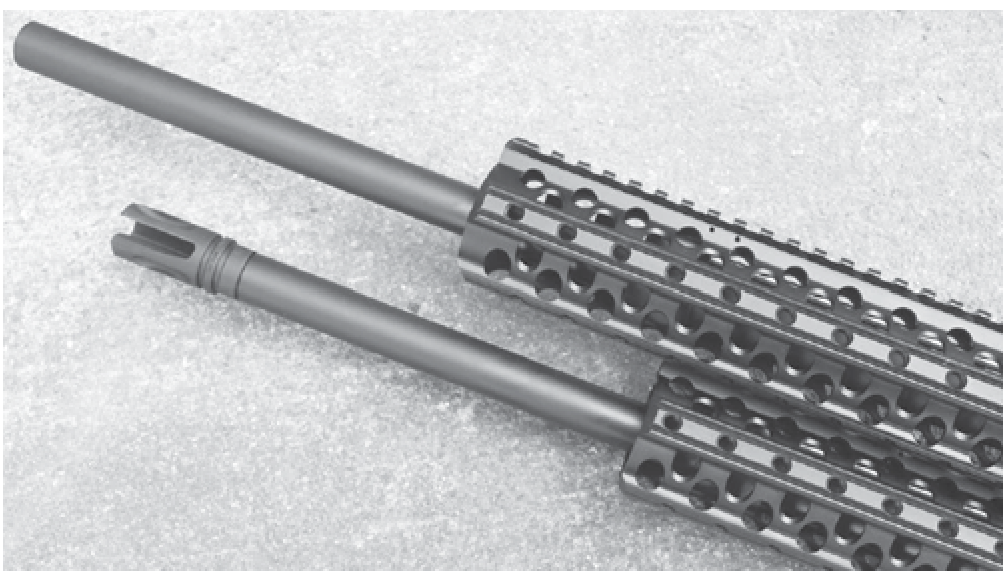
a 125 grain Nosler Ballistic Hunter bullet, at the easily-achieved speed of 2375 fps. With a zero of 175 yards, the bullet is 1.7” high at 100 yards, and 6.6” low at 250. Out to 200 yards, the bullet is never more than 1.7” from the point of aim. Basically, out to 200 yards you are point-of-aim, point-of-impact, and at 250 yards you need only hold 6” high. So unless you are sniping deer down the powerline cuts, you have a trajectory that is more than flat enough.

It is easy to see that the 7.62X40 case has a shoulder further up, and thus can hold more powder. It is not intended for use as a subsonic launcher.

When it comes to hogs, Bill has put a number of them all four hooves in the air with one well-placed shot. In my testing (I had to be content with paper and steel) the results were eye-opening. Once I had the rifle zeroed, I ran drills and popped steel until I had the rifle warmed up and I was used to the very excellent trigger Wilson Combat had installed. (When you order yours, you’ll have the options of single or two-stage triggers, match or Mil/LE, and each of

them installed by a gunsmith with years of experience.)

Ammo, lots of ammo. And reloading data, too.



Barrel lengths? Wilson has barrel lengths. The two sent me (I'm not allowed SBRs) were 16" and 20"

The mild recoil actually made group-shooting a nerve-wracking experience. I could follow-through and see each shot through the scope, and see the groups building. After all, they are (relative to the usual .224” bullets) putting honking big .308 holes in the cardboard. It can be hard to disassociate your mind from the task enough to not be distracted by the knothole group you can see, and still stay involved enough to perform the basics again and again.

There were no malfunctions, but then I would not have expected any. Indeed, I’d have been stunned to see a single one, as Bill and the crew have long-ago proven they know how to build reliable firearms.

If it sounds like I’m really enamored with this rifle, you’re right. That said, I’d probably also jump in and start changing things, as I typically do. First, for me, a rifle has to have iron sights. Well, maybe a bolt-action hunting or sniper rifle not so much, but on an AR, it has to have sights. The great thing about the Wilson Accu-rizer scope mount is that it comes off easily. Just grab onto the knob, crank it loose, and you’ve got a clear view of your irons. Use a paint pen to mark the location before you go on-and-offing it, and you can put the scope back on, returning to zero. The selector is not ambidextrous, but if you want one they are easy to find, and the Wilson lower, being correctly-made, will readily accept many designs. Alas, my home state does not allow suppressors for hunting, so I can’t go on expeditions to silently sluice hogs by starlight. For defense I’d stick with Bill’s excellent Accu-Tac flash hider. I’d experiment with .30 caliber compensators (Wilson combat 7.62X40 barrels are threaded 5/8”X24), and when I found one that reduced the already controllable recoil, it would be on my hog-shooting upper.

I’m still on the fence about the Roger Super-stoc™. I really like that it has a top loop for a sling, but the locking cam lever doesn’t do anything for me. I guess I’m so used to simply crushing the stock into my shoulder on presentation that I don’t feel any play between stock and tube. It does, however, have a rubber recoil pad that

ensures a non-slip mount, and QD recessed sling swivel sockets. It also fits both mil-spec and commercial buffer tubes, a definite plus.

I'm sure the desirous amongst you are thinking this is a great setup, and think you can save a few bucks by buying cheap magazines and modifying them yourselves. Give it up as a bad idea before you even start. The Wilson Combat-specific modified magazines cost you a grand total of three-and-a-half bucks each more than regular L5 mags. By the time you're done experimenting, and destroying who knows how many test magazines, you could have (and should have) just bought the correct ones.

Oh, and the best part: If you want a rifle in 7.62X40, and you have a rifle or rifles on hand and know how to assemble an AR, you're in luck. The only two things that differ from the norm, that you need in order to build your own, are the barrel and the magazines. Bill has a full line of primo stainless barrels, and would be more than happy to ship you the one of your choice in length, rifling type and weight.

ALEXANDER ARMS
.17 HMR

And Hornady ammunition is accurate, which should not come as a surprise. Just don't expect groups like this on a windy day, as the tiny .17" bullets are very wind-sensitive.

The bolt, extracting a fired round.

Upon meeting Bill Alexander, most people fall into one of two camps: those who feel he is an opinionated, know-it-all show-off, and those who recognize the amazing engineering mind at work. One thing is for sure, if you can keep up, no conversation with Bill lasts “a few minutes.” You’ll be at it until one or both of you are exhausted, because that is the depth of his knowledge.

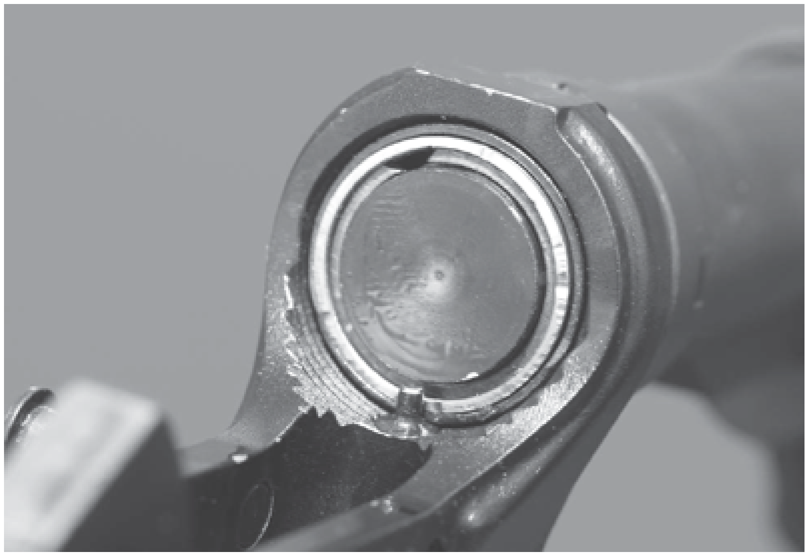
Bill, as most of you know, designed the 6.5 Grendel, which we have covered before. It is, to condense the process down beyond simplification, a necked-down, blown-out 7.62X39, by way of the .220 Russian case. It boosts a 6.5mm bullet to moderate velocities. The big deal is not that it boosts them to moderate velocities, but that the 6.5 projectile, in certain models, is so ballistically slick that it does not lose as much velocity as it travels downrange. It doesn’t start out as hard-hitting as some, but by the time it gets there, it has caught up. (Or rather, the others have fallen back.) So you get mild recoil with retained velocity downrange.

What caught my attention some years ago was the upper he was making he called the .221 Genghis, an AR upper chambered in 5.45X39. This was very early in the importation of surplus commie ammo, and there wasn’t as much of it as there was of 7.62X39. Plus, there weren’t that many AK-74s to be had, so it wasn’t really cool to

most. Me, I figured it was uber-cheap ammo, and I wanted one. However, Bill the engineer kept a close eye on the performance of the soviet-era ammo being imported, and dropped the Genghis. Simply put, the variability of the ammo was so great, he wasn't comfortable offering an upper to use it. Oh, the AK didn't care, but the AK design is so over-gassed and the operating mass so great that it didn't matter. But the AR is much fussier, and Bill didn't want the (as he anticipated) steady stream of unsatisfied customers wanting to know why their Genghis uppers were unreliable.

To fill the void and to work in the other extreme, he came up with the .50 Beowulf, a straight-walled .50 caliber round for the AR upper.

The Alexander Arms 17 is clearly marked on the bolt, which is the part that appears to be the carrier.



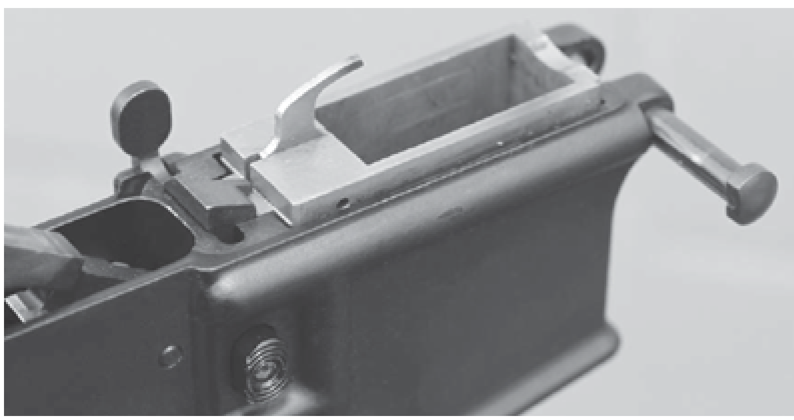
If you convert your existing lower to use the .17, you'll have to remember the recoil spring liner. That has to come out before you can work the bolt after you've switched back to .223.

Hornady makes .17, and makes it by the truckload.

Which brings us to his latest project: an AR in .17 HMR. The .17 Hornady Magnum Rimfire comes to us from the .22 Winchester Magnum Rimfire, circa 1959. In the late 1950s and early 1960s magnums were all the rage. The .22 WMR stepped all over its little brother. Where the .22LR might shoot a 40 grain lead bullet (no

jackets for the older sibling) to 1200 fps, the .22 WMR comes close to 2,000.

Finding a suitable rifle for the round did not prove as easy as anticipated. With a chamber pressure of 25,600 PSI, it is about as much as you can handle in a locked action designed for the .22LR. But manufacturers, ever anxious to deliver product to the shooter, persisted in their efforts to make it work, which was all fine and dandy until Hornady came up with the .17 HMR. To distill it to its essence, it is a .22WMR necked down to .17. It has the same overall length and the same operating pressure. But making it work in a self-loading rifle proved even more problematic than getting the .22 WMR to work had been.



The magazine well filler also has its own ejector, to toss the tiny .17 HMR empties out of the way.

The Alexander Arms conversion uses a magazine well filler to accommodate the smaller magazines.

Unless you are going with a gas-operated rifle, which is theoretically possible due to the jacketed bullets of both the .22 WMR and the .17 HMR, you need more than just chamber pressure. You need momentum. You need bullet mass to work the industry-standard blowback action of rimfire autoloading rifles, and the .17 HMR, with bullets weighing from a mere slip of 15.5 grains up to a “hefty” 20 grains, offer at best half the bullet mass of the .22 WMR. Great, make the bolt lighter. Oops, that leads to other problems. Like, the bolt moves before pressure has vented, and you find extractors ripping through rims. Plus, combining a bottlenecked case with a blowback action is just asking for trouble. If you were to experiment down that path, remember this hint: one sign of early-opening is stretched case shoulders.

So you increase bolt mass to deal with the pressure. Oops again, as the mass of the bolt, on feeding, crushes your loaded round against the feed ramp. Or the excessive mass causes a short-stroke. A heavier action spring, to delay opening, may also cause short-stroking, if the round doesn’t have enough oomph to overcome the spring.

The balancing act of getting a .22LR to work reliably is like juggling three tennis balls. Balancing the needs of a .22 WMR is like juggling a tennis ball, softball and nerf ball. The .17? Juggle three balls, spin some plates, tell a joke, and pull a rabbit out of your hat. All at once.

For those manufacturers who are making bolt-action rifles, adding the .17 HMR to the lineup was simple: a new barrel, with the appropriate chamber, bore and barrel rollmark is all they needed. The rest of the parts in the rifle – receiver, magazine, bolt, stock – are identical in dimension, and the back-thrust the bolt experiences is also the same. No one out there can work a bolt so fast as to create a problem with brass not having contracted (short of excessive pressures) or with residual pressure causing case-stretch problems.

However, any self-loading action is a delicate balance of dynamic forces. The blowbacks are more so, and asking an action to smoothly handle the .17 HMR is enough to make any rifle designer stay up late at night.

In steps Bill Alexander. Bill didn't think it would be that big a deal to handle the .17 HMR. He figured a bit of testing, some engineering razzle-dazzle and the problem would be solved. A year later he was still hunting down solutions to details that had annoying bugs. When I talked to Bill about this, he said, "The .17 HMR project took more time than the .50 Beowolf and the 6.5 Grendel combined." The result was not just a self-loading .17 HMR that works, but one clothed in an AR receiver. The heart is a stainless barrel in .17 caliber, with a twist of 1/10. The rifle Bill sent me features the Alexander Arms spiral fluted exterior. There were details of this rifle that puzzled me that were cleared up when I talked to Bill. The rifle I had? Not just an early rifle, but the first prototype. It worked like a charm, which is why it was sent to me for testing right away. And its promise had Bill working overtime, because prototypes number two, three and four were all demon-children, causing all kinds of problems, and headaches for Bill.

The bolt is unlocked, simply a blowback, which is all the .17 needs, but it is made of aerospace-grade steel.

On the front end the barrel is threaded the common ½-28X thread that all .223 rifles use, so you can put on any muzzle brake or flash hider you desire. I have to warn you that doing so will be almost entirely a cosmetic exercise. The .17 HMR neither has enough muzzle flash to warrant a flash hider nor enough gas pressure at the muzzle to drive a brake or compensator. But it is a snazzy crown protector.

The threads also permit (mechanically, you'll have to clear it with the Feds) the installation of a suppressor. Now, the .17 is hardly an ear-blaster, and what muzzle report it generates is primarily the supersonic crack of its bullets, 2200 to 2400 fps. So putting a suppressor on it to reduce the overpressure is likely to be an anticlimactic event. It may well sound just as loud suppressed as it does un-suppressed. I don't know yet, as my "cans" are still in the paperwork stage.

The bolt is made of ETD 150 steel, a chrome-moly-manganese-silicon alloy that is easily worked, and Bill loves it. "ETD 150 is essentially aerospace-grade pre-hardened 4140, and a joy to work with." Why use pre-hardened steel? Warpage, or rather, the lack

thereof. You see, if you machine un-heat-treated steel, when you go to harden it, the parts will not – cannot – cool evenly. There is some warpage. At that point, your choices as a production engineer are two: design the parts so the warpage you encounter is not great enough to cause a problem, or machine it after hardening.

Recoil is so mild you can see the bullet impact on the hill even in a less-than-steady position.

The feed trays on some belt-fed machine guns have been manufactured by machining parts and then welding them together to produce the otherwise difficult-to-machine tray. Some trays were so complex, and had to be made of such tough alloys, that the manufacturers calculated (and then experimented) with making them deliberately off-spec. In the opposite direction of warpage. That way, the inevitable warping from the heat of welding (temperatures not unlike heat-treatment) would bend them back to be in-spec. Nerve-wracking stuff.

Bill figured, if you are going to finish-machine the bolt post-hardening, then why not just do it all post-hardened? And with CNC machining centers, cutting hard steel precisely is not a problem.

In the AA .17 HMR the bolt is also chrome plated. Well, yours will be. This one wasn't, which later was changed. If you have a host of rimfire converted ARs, you don't have to worry about getting this

one confused, the bolt is clearly marked “17-HMR” through the ejection port. While the .17 (and .22) HMR run cleaner than their .22LR predecessor, all blowback actions run dirty, and having a slick, easy-to-clean bolt is always welcome. The bolt is also much heavier than that of its .22LR cousins, as befitting the .17 HMR chambering. The extractor is hardened stainless, again an easy-to-clean part on a design that will get grubby after you’ve used it to relentlessly hose varmints in the back forty.

The desire to have an easy-to-clean bolt lead to it being hard-chromed in production, resulting in magazine problems. It seemed the lower friction of the chromed bolt sped up the cycle of the bolt, which in turn required a heavier magazine spring to keep up with the bolt cycle rate.

The rifle Bill sent me featured a carbine buffer tube, but it can be re-built (or come from Alexander Arms) to a solid, A2 stock if you wish. The recoil spring is inside a sleeve in the buffer tube, another approach Bill took to make the .17 reliable and adaptable to any lower. It also precludes using a .223/5.56 upper with the .17 buffer assembly installed, a clever move on Bill’s part that will prevent someone slapping a .223 upper onto a .17 HMR-built lower and busting things up before they realize it. You have choices on the forearm. One is the AA MK10 Plus, a mid-length free float tube composed of G10/FR4 composite with a big aluminum barrel nut holding things together. If your varmint-slaughtering tool of choice simply has to have an acre of rail estate, then you want the Mk 3 mid-length monolithic rail receiver from Alexander Arms instead.

The extractor on a rimfire magnum leads a hard life. Bill was expansive on the extractor, too. “The extractor works hard to pull that long case out of the chamber, and we started with 416 stainless. But it soon became clear we needed to go with 17-4 precipitation-hardened stainless, a tougher and harder alloy.” Tougher and harder sounds good-er to me, when it comes to an extractor.

When the AR-15 was first designed, the firing pin proved to be just a bit too heavy. The Army was not willing to live with one accidental discharge per hundred thousand rounds chambered, and

so the firing pin was made lighter and lighter until the acceptable number of ADs (zero) was met. The priming of a rimfire cartridge is, no great surprise, in the rim. It requires sometimes a stout impact to set it off. The AA .17 HMR firing pin is sturdy to withstand many cartons of ammo, and it uses a return spring. Rimfire rifles can be quite sensitive to firing pin impact, and you want immediate and full ignition for best accuracy. However, you can't have a free-floating firing pin in there, at least not one of any significant weight. So, Bill takes a sturdy firing pin and designed the bolt to have a firing pin return spring in it, to control any firing pin bounce on feeding.

In the lower, the .17 HMR magazines require an adapter block, or magazine block, in order to fit. Could Bill have made his magazines just like the now-common .22LR magazines, identical in profile to standard mags? Sure, but that would confuse things. The Alexander Arms adaptation uses a caliber-specific extended latch to hold the magazine itself. The adapter block is held in mainly by the magazine catch (as some conversions do) but the new catch has an extra step to keep the block in place. Also, there is a set screw to lock the block in place. That screw eliminates block wobble and ensures reliable feeding.

The .17 HMR magazines are made of molded acrylic, a very hard plastic, but one that molds to precise dimensions. And cheap, too. You see, among the other quirks it has, the .17 is very sensitive to feed lip dimensions. If the magazine wears you lose reliability. Again, Bill was clear on this point. "I could make magazines out of tool steel, and they'd still wear. This way, they are precise, but if or when they wear, you can buy new ones for a pittance." And yes, he is planning on making hi-cap mags. When I called him on his cell phone, he was at the range testing designs for hi-cap magazines.

The conversion is designed so that you can install the .17 HMR upper on your lower, plug in the adapter block and magazine catch, the buffer tube spring assembly, and go to work. You use the recoil spring system of the conversion that is appropriate for the buffer tube (carbine or rifle) on your lower. That means, if you have a

custom trigger assembly in your lower tuned for a clean, crisp target trigger pull, it is now available for your varmint-shooting expeditions.

This much ammo should last you at least a couple of afternoons of plinking.

To add to the one-of-a-kind nature of the rifle, Bill sent his first .17 HMR prototype upper installed on the first .50 Grendel-marked lower Alexander Arms made. With box-stock fire control parts, the lower worked just fine. So, if you have not yet invested in a custom or match trigger, you don’t have to worry about your .17 upper working on your box-stock mil-spec lower. It will.

Gear is fun and the details matter, but what it all comes down to is shooting. And there, I have to report almost complete success. First off, the .17 HMR is a varmint-shooting cartridge. It has no other reason to exist, as it is far too expensive to use as a plinker. For the cost of .17 HMR, you could be (around $200/thousand rounds) just as easily shooting reloaded .223. (Sorry, Hornady, but that’s the truth.) If it is going to be a varmint round, it had better be accurate, or better yet, very accurate. Well, here you have no fears.

Rimfire rifles are notorious for being picky about ammo, and for being very particular about how they are fired. The jacketed bullets of the .17 make it less so, but, they can still be touchy. I found that out, my first day at the range with the Alexander .17, as I was scattering shots all over the place. I knew it couldn't be the ammo, as I had just received a brand-new shipment from Hornady. So, I shot chrono info and function-tested the Alexander rifle and came back another day. That second day, with no coffee and good weather, I got back to good technique and shot very nice groups indeed. The little .17 caliber bullets are quite wind-sensitive, but my range is in a valley, and with no wind I was shooting 1 MOA with it. The Bushnell 10X scope, held in place by an American Defense QD quiklock mount, made it easy. Oh, Bill loves the Bushnell 10X. "You can't break them. I've shot truckloads of ammo under the Bushnells I have, and none have given me any problems."

Recoil? You can't be serious. No, I mean it, there isn't any to speak of. Do the math: a 20 grain bullet, at 2400 fps, generates a thundering power Factor of 48, where the minimum allowed to shoot USPSA/IPSC or IDPA is 120, with a handgun. The 48PF comes out of a carbine that can weigh as little as six pounds, or as much as ten. Get serious, there's no recoil. I could see the bullet holes appear in the target, and when I was whacking odd bits of debris on the backstop, I could easily watch the impact through the view of the scope. Follow-up shots on missed varmints can easily be applied, although your success will suffer, as they will probably be moving by then.

The case shoulder location is a big clue as to how well a system handles a cartridge.

In all that time I had one failure to feed, and that came with the 15.5 grain NT load. The NT means “no toxins,” as in no lead. A fifteen-grain lead-free bullet is a challenge both ballistically (they shot well) and functionally. When I told Bill, he remarked “Ahh, the 15 grain bullet, the nemesis of the .17 HMR. That one gave me more trouble than the rest combined.” My sole malfunction was a bolt-over-base failure to feed, that jammed the bottom lip of the bolt into the case. Which is exactly the kind of problem the (new) heavier magazine springs will preclude. And since I’m not likely to be charged by a wounded varmint, and it happened early-on in the break-in period and never recurred, I’m not worried. I’m not sure I’d go so far as to use it on critters larger than the various smaller families of rodentia, but for those it excels.

I’m not so sure that the upper, as just an upper to swap around on rifles, will be the one you want. All AR owners, once they’ve had a few range sessions under their belt, abandon the idea of owning only one lower and having multiple uppers to install on it. That is Bill’s plan. “The guy who wants to go shooting varmints isn’t going to settle for a mil-spec trigger, on his one-and-only lower. We’ll be making complete rifles straight away.” And that is my plan too, to

get a complete Alexander Arms rifle in .17 HMR. I already have several cubic feet of ammo from Hornady.

I don't often get a chance to hose varmints, but the next time I do, it isn't as if the recoil of the .17 is going to cause me to quit early. Thirst, hunger, loss of daylight, they can put an end to a shooting session, but with the .17 HMR, the physical limit is how many times can you pull the trigger?

DEL-TON TAPCO

Hard to complain about accuracy such as this. I'm sure someone will, or find other fault, but I'm happy.

Del-Ton makes good rifles, even though some shooters are so class-based they won't acknowledge any rifle not made by the "best" or "mil-spec" companies. Their loss.

There are those who spend an inordinate amount of time producing lists that rank items. The top ten this, the bottom ten that, the "good" the "bad" and the "ugly." Okay, that last one is a movie, but even movies get ranked. In the AR-verse, those who rank go to a lot of trouble to rank rifles and producers. Woe to the manufacturer who does not make the top of such lists.

Well, there are makers of ARs you should avoid. But a lot of the talk is based on assumptions, small sample sizes and just plain "I had a bad rifle, so they are all bad" reasoning.

I've wanted to investigate the Del-Ton rifle line, but I never managed to get around to it, until now. And in case you haven't made the connection, Del-Ton is one of the companies that some list makers love to hate. The Del-Ton carbine sent to me is a collaboration between Del-Ton and Tapco. Located in Elizabethtown, North Carolina, Del-Ton offers a huge array of rifles and carbines, as well as parts for them, accessories and all the mouth-watering goodies you could ever wish to bolt to your AR. Many of the items they list are made by manufactures who are on the tops of lists of "good" ARs, so it is kind of hard to square that with "Del-Ton isn't good" venom. Tapco comes in for its share (fair or not) of dislike, and again, I can't see it. Sure, they may use

different polymers, formulations that won’t stand up well to NATO-spec chemical, biological and radiation warfare decontamination. Do you really need that? And if you do, let me know where you live, so I can stay the heck away.

Marked with the Del-Ton logo, a stylized DTI, and with the flat-top rail slots numbered and filled, the carbine is smoothly finished and deep black. No purple or gray here.

The rifle itself is your basic stoner-style carbine, direct gas impingement with a 16” barrel complete with M4/203 barrel cut, and a fixed front sight base. The important parts are all in the details. Not that the details themselves are always critical, but attention to detail tells us a lot about those who make an item. The front sight is fixed, but it is “F” marked and the correct height for an M4 carbine. While the rifle as-sent did not come with a rear sight, any you would wish to bolt to it will line up correctly with the front sight. Some makers overlook this and ship a flat-top upper with a non-F height front sight, presenting problems in getting the thing to sight in. Not so with Del-Ton. It is also held on with taper pins, another good sign. The barrel has a 1/9 twist, which isn’t mil-spec, but common, and has a 5.56 chamber. And yes, that is a detail that is critical, as I mentioned in the chapter on the differences between this and the .223. I used my Michigun chamber gauge to check, and while I can feel a little bit of rubbing at the rifling leade, the neck and throat are 5.56 length and diameter. Well done, Del-Ton.

Really, if you didn't turn it over and look at the "Del-Ton" on the other side, could you tell it wasn't a "tier one" rifle?

Drop in the M-Guns 223/556 gage, and voila`, we find a true 5.56 throat and leade. Again, well done Del-Ton.

A 1/9 twist, the new normal, but a source of complaints from the "mil-spec or nothing" crowd. A 5.56 chamber? We'll soon see.

The stock is standard M4, but with a twist: it is sand/desert color (aka flat dark earth), made by Tapco and so-marked. (And just as a small departure from my usual dispassionate, reasoned and detached observation, who the heck named this? I mean, "dark" earth? Where would this color be dark? Some place with white sand beaches? Okay then, in the Caribbean it is dark. The rest of the world calls it tan, beige, sand or worse.) The stock slides on a commercial-diameter buffer tube, while inside of it is an "H" buffer. While military-diameter buffer tubes are theoretically better, I've given up caring about which is which. Does it fit? Yes, this one does fit well. Then we're fine. The buffer tube castle nut is staked, heavily, and in two places.

Inside, the hammer is a modified (the top, autosear lug is ground off) M16 hammer, the carrier is a shrouded (M16) carrier with the auto-sear shoulder ground back. The trigger pull is proper mil-spec, in that you can feel the over-travel when you dry-fire, but when shooting you don't. The carrier key is properly (read: heavily) staked, and the interior of the gas tube and the carrier are both properly hard-chromed. While the carrier and bolt are not marked as to the manufacturer, they have the typical machining marks that you'd see on carriers by any of the top-quality makers. That is, none, as the surface is properly bead-blasted before being parkerized. Obvious care has gone into these parts. If Del-Ton doesn't make them themselves, they take care in obtaining them from someone who knows how to tend to details. The extractor spring is correctly installed and has the black insert in it. The feed ramps are M4, the lowered down into the receiver cross-section ramps, and the

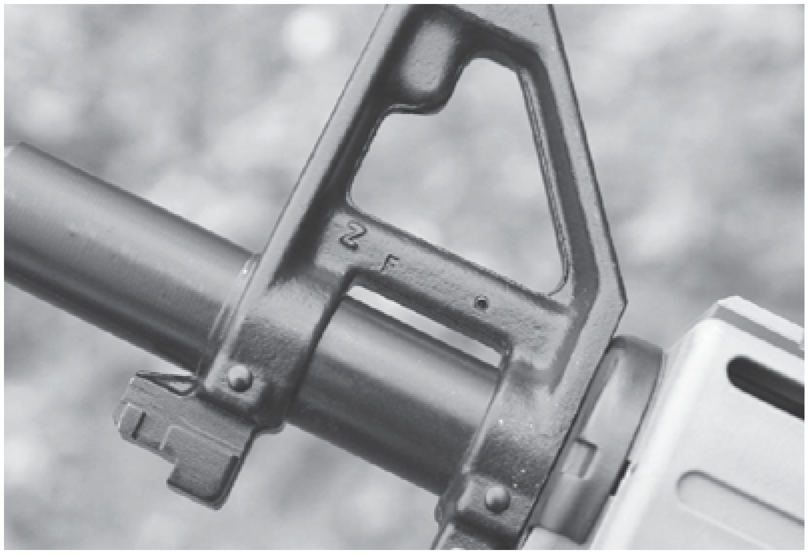
machining was done before the upper was anodized.

Combining with Tapco, Del-Ton offers a nicely-spec'd rifle that is a good starting point. Or just a good rifle, period.

A reliable rifle, but one thing I'd have to change is the SAW-shape grip. As you can see, the extra length and swell doesn't do anything for my grip.

The handguard is the Tapco Intrafuse handguard. It is a rigid but not free-float handguard, with a rail the full length on top and bottom, and half-length side rails. The bottom and side rails have covers, while the top rail is left alone. You can leave it as-is, or take the cover or covers off and mount gear there. With the covers on, the handguard is a bit portly. But some like that, and if you find it is just a bit biggish, you can take the covers off. Me, I like to run handguards as small and trim as I can, so leaving them off would be my choice. However, I left them on for testing simply because it makes it easier to keep everything together when it comes time to send stuff back. (Yes, I send stuff back. Manufacturers are not commonly in the habit of sending out expensive freebies, and in the early years I would get requests for the missing bits and parts, if I wasn't careful to keep things all together.)

The pistol grip is one of those things that just puzzle the heck out of me. The Tapco pistol grip on this rifle is their take on the SAW/M249 grip. The angle is different from the original AR, and the grip itself is wider, with a taper out towards the bottom. Those that love the SAW will love this one. Me, I am not a fan of the M249 grip. To be fair, while every time I handled the Del-Ton carbine while not on the range, I curled my lip a bit whenever I had to hold the pistol grip, when I was shooting it I never noticed what kind of grip is on it. Always go by what improves your score or performance and not what feels or looks good at the moment. And especially don't go with what is "tactical" cool, or mil-spec. If it improves your score, it is good. If it doesn't, it isn't. And if it hurts your performance…..well, ditch it.



An "F" marked front sight forging, so your folding rears will fit and getting zeroed won't be a hassle.

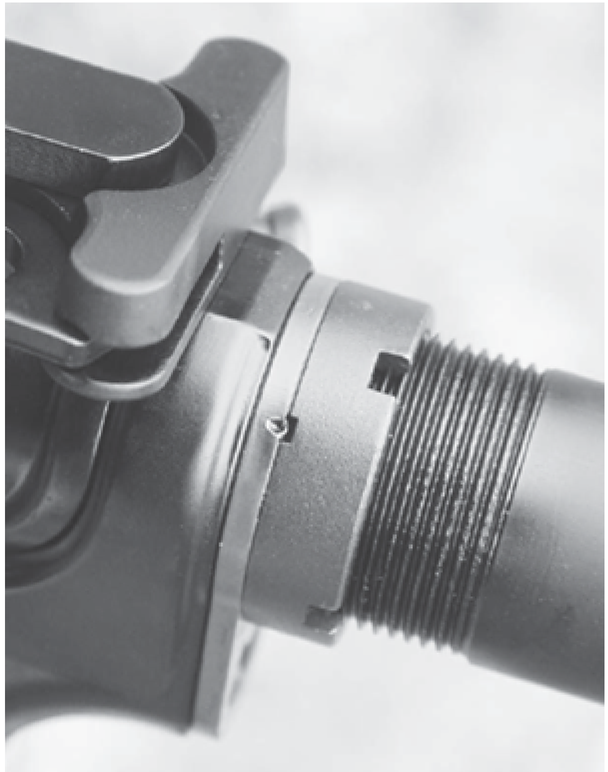
The Tapco handguard offers rail estate, albeit a bit portly for my tastes. But some of the shooters who tried it loved it, so it simply proves you should try things for yourself.

Along with the rifle, in a Del-Ton marked hard case, came a pair of Tapco Intrafuse Gen II magazines, also in flat dark earth. Tapco has continued to compete in the magazine arena, and the Gen II magazines feature anti-tilt followers, with generous gunk clearance to allow unwanted debris to pass, a 17-7 stainless spring, and improved feedlip dimensions that make the Gen II a drop-free magazine even when loaded. I was not to the stage of AR abuse that

I later began, so I didn’t have a chance to abuse either the Del-Ton or the Tapco magazines.

Since the rifle arrived lacking a BUIS, and I needed something with which to aim, I simply bolted on an EOTech sight to do drills and added an Insight ATPIAL to check sight tower clearance and function. The EOTech bolted right on (no surprise there) and the ATPIAL cleared the sight tower, so I was good to go. In blasting a bunch of ammo through the Del-Ton carbine, I found only one problem: one of the magazines was not happy with a match 52 grain hollowpoint load I find to be quite accurate. To be fair, this is a varmint load, designed to be a prairie dog tactical nuke and not what you’d use in a defensive carbine. It is also far too expensive to be used simply blasting in a defensive carbine class. Plus, only one of the magazine had problems, and then only occasionally. Everything else fed flawlessly. A definite case of “if it hurts, don’t do it.” If I were to use the Del-Ton carbine as a defensive rifle, I’d certainly make sure it worked 100% with whatever defensive load I was using. If I really had to use the 52 grain varmint load, say on varmints, I wouldn’t’ worry about occasional malfunctions. I have never read yet of a shooter being charged by varmints.

For formal accuracy testing I clamped a 30mm Famous Maker 4-12X scope in a LaRue mount on top of the receiver. What I found was that this particular rifle loves, to an excessive degree, Hornady TAP 55 grain ammo. I would have to seriously over-indulge in coffee to give myself the shakes sufficient to shoot a group over 1.5 inches in size. Most hovered right under one inch. The rest of the ammo I tried shot equally gratifying groups. One detail I wanted to check was the accuracy with one of the new heavy bullet loads. Some 1/9 barrels shoot the 75 and 77 grain loads fine, others aren’t so happy with them. The Del-Ton carbine showed a bit of accuracy drop-off, but still shot well. I would have to spend some time with it to see if the accuracy improves as the barrel breaks in, or not.



The castle nut is heavily (read: properly) staked, something you don't always fi nd on "better" rifl es. Del-Ton did this right.

I didn't have a chance to go out to the National Guard base and thrash the little plastic "ivans" on the computer pop-up course, but I have no doubts that with it I could easily post more clean scores. Del-Ton, I should have looked at your rifles earlier, but I'm glad I finally did.

Now, if someone tells you that Del-Ton isn't as good as something from the ABC tier, well, maybe, maybe not. The real questions are these: Does theirs work better? Does theirs shoot more accurately? Can they shoot theirs faster and more accurately than you can shoot yours? Unless the answers to all of these is an unequivocal "yes" then pay no attention and keep on shooting.

SIG 516

The Sig 516 is not just another AR, it has extras built right in, starting with the QD sling sockets in the rear of the receiver.

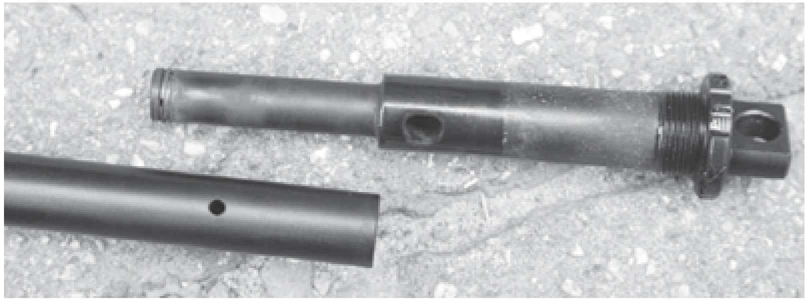
The 516 has clean lines, it would be a shame to lard it up with all kinds of bolt-on extras.

With the superb 551-2-etc models that Sig has available, you'd think that they would not want to be in the AR business. But since it is their business to make products that sell, Sig decided to get into the AR end of things, and they did so with a piston gun.

The lower is a very nice looking A2, with a very billet-cut look about it. The magazine button fence is rectangular, not the rounded forged shape. The rear of the receiver has machined-integral, quick-detach sling swivel sockets, a very nice touch. The magazine catch has a button on the right side and a lever on the left, so you can drop mags either way. The bolt hold-open is only on the left, the standard side, so lefties only get half a loaf here.

The front of the mag well has vertical grooves, perhaps to lighten it, but certainly as a gripping surface for those of you who muckle onto the mag well to shoot. That isn't often my style, but for those who do, you're accommodated by Sig.

In an interesting variation, the serial number is not on the magazine well. It is stamped into the receiver between the hammer and trigger pins. I have no idea why, but I'm sure there's a reason that made sense to someone. Hey, you've got to put it somewhere, right?



The piston port can be pulled out. If you want to have a different gas flow for your suppressor, this would be a relatively easy thing to make.

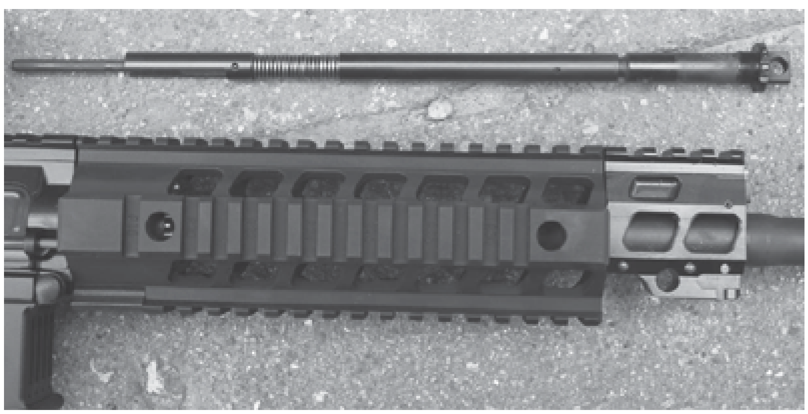
The pistol grip and stock are Magpul, so you can't claim Sig has gone cheap on the extras. Not that Magpul is expensive, but it certainly is good.

The handguard is railed, and free-floats the barrel. While it has rails at the cardinal points, it isn't a big fat handguard. It is actually kind of slim for being an all-rail front end. The top rail is the same height as the top of the receiver and, in a nice touch, the rail and receiver have an interlock. The top rail has a tab on the rear, and the receiver is machined to position the handguard and keep it in place. It is a sharp and clean way to keep the handguard from rotating under stress (as in, vertical foregrip and lots of adrenaline).

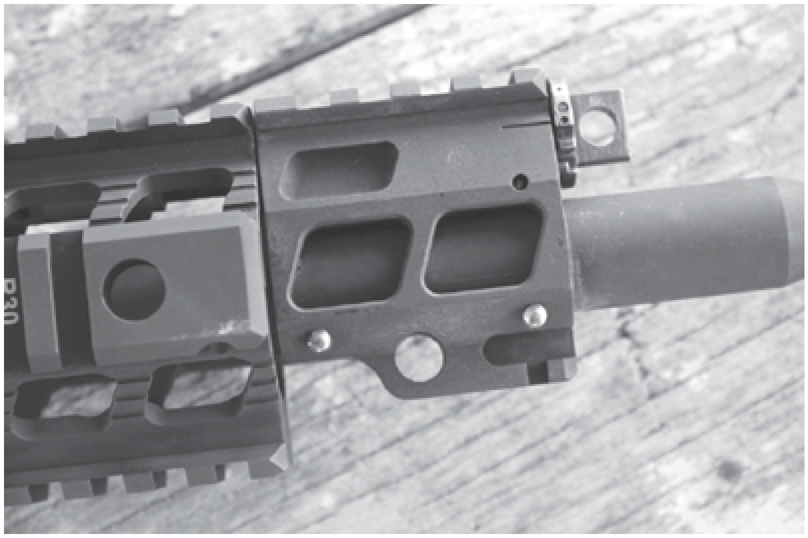
Recoil? What you'd expect from a trim 5.56 AR-based carbine – really not much.

Inside the handguard is a top-notch barrel. Made of "military grade" steel, it is phosphated on the outside and chrome-plated on the inside. The chamber is 5.56, and the twist is 1/7. The piston system is contained in a gas block pinned to the barrel, and the system has a regulator/disassembly key on front. You depress the plunger beside the key and turn it to one of the three settings. Or, you depress it, turn and remove the key, as part of the disassembly of the gas system and cleaning.

The piston shoves a new carrier, designed for the system. It is not simply a standard carrier with a new bit of steel bolted to the top. The piston shoulder is an integral part of the carrier, and the carrier is sculpted so you can clearly see through the ejection port that it isn't the old design.



The 516 piston system is easy to strip and clean.



You cannot mistake the Sig piston block for any other rifle.

Sig also offers their own red-dot sight to go with their rifles.

On the end, we have a standard A2 flash hider. Nothing wrong with that, and those who want something different will have a hundred different opinions on the subject. Sig doesn't want to be stocking dozens of flash hiders, so they give you the mil-spec one. Fair enough.

Sig had sent me a brand-new rifle, out of the brand-new first production lot, so they weren't too keen on me throwing it in the

mud. No problem, I understand, next time maybe. So I simply shot it a lot, tried different scopes and mounts on it (they all fit) and did my best to make it croak without benefit of dirt, mud, water or trucks. In that I failed, which did not come as any surprise. After all this is a Sig. The trigger was clean and crisp, but since it is a semi-auto version of the mil-spec parts, it wasn't your light match trigger. For that you'll have to go with the sig Precision marksman version and its two-stage trigger.

In the accessory department, Sig offers their own compact red-dot sight and a laser/light vertical foregrip.

While the Sig 516 is certainly an exemplary sample of the AR-15, these days that is not an notable thing. Everyone has an exemplary AR-15, or if they don't they don't charge that much for it. So why buy a Sig? Gee, I don't know, perhaps you want an accurate, reliable rifle, made with top-notch components; one that accepts all the aftermarket accessories that you could desire or afford; a brand-name you can depend on, and which will certainly gain you the respect of the other shooters at the gun club. And all this at a competitive price.

Maybe I shouldn't send it back…..

STAG ARMS 3G

The upper and lower are basic, standard AR flat-top models, but what's built in is what matters.

The Stag 3G model is meant for 3-gun competition, but it works well in almost all other forms of AR use as well.

In some circles, Stag comes in for a lot of AR-hate. I just don't get it. They are a top-notch, mil-spec maker of ARs (a lot of the "better" ARs some tout are actually made, in parts or in whole, by Stag. Go figure). I've been to the plant and seen them make the parts and rifles. I've been to a lot of manufacturing plants and I know good detail-oriented work when I see it being done. But for some, the "deer" on the side of the receiver just grates. Fine, that means there will be more product for the rest of us. And what Stag just came out with is something you should want.

Stag has unveiled a top-end AR that is meant for a particular market; the 3-gun shooter. However, it is more than just that, as the evolution of the AR has brought us to a realization: the top-end AR is a very versatile rifle, one that can do a lot more than you might think.

The AR market has fragmented a bit. We have the tactical guys who want mil-spec (except for a subset who want better-than-mil-spec), short barrels and lots of rail estate. We have the High Power shooters who want a crisp trigger, a fifteen pound rifle and accuracy at 600 yards that would take your breath away. We have the varmint-shooting guys who couldn't care less about rails, mil-spec or

anything else. They just want sub-MOA accuracy even when the barrel is blistering hot. Taking attributes from each, we have the 3-gun shooters, who want it all: reliability, accuracy, heat endurance and a clean trigger, and they want to ditch anything they don't need. And then there are the general mass of shooters who want to plink and maybe even hunt.

The Stag model 3G is built on your basic AR, with a flat-top upper receiver and standard lower receiver. Nothing fancy, proprietary or oddball. However, what Stag has assembled onto and into those receivers is something else. On the back end is a Magpul ACS buttstock on a carbine buffer tube. The stock contour is far more useful than your basic mil-spec M4 stock, and the adjustments of the carbine tube allow it to be set for almost any shooter or application. The wedge-shaped top of the stock is a lot more comfortable than the mil-spec M4 stock, and even allows for storage of extras.

The two-stage trigger offers a crisp, clean let-off and precise shooting.

Inside, Stag has used the exemplary Geissele two-stage trigger, in this instance their 3-gun trigger, for a clean, crisp trigger pull with a short reset and quick locktime. Yes, one can do well with mil-spec parts, I've shot many perfect qual courses with a rack-grade trigger, but if you wish to shoot the smallest groups or the fastest times, a

light, clean trigger is a must. Plus, the 3-gun shooter is often using a 1911 with his or her AR. That means a clean, crisp trigger and short reset on the rifle is a must, so it matches the handgun.

Stag has installed an 18” stainless steel barrel with a 1/8 twist on the 3G. A stainless barrel can be made to a higher level of accuracy and finish than a chrome-plated military tube, and the one-turn-in-eight twist stabilizes bullets from varmint to heavyweight. The mil-spec guys will bemoan the lack of chrome, but the top shooters don’t want the loss of accuracy chrome brings. Oh, it isn’t much, but it is still a hindrance.

When it comes to non-standard barrels, you always have to consider gas port location. So, at less than twenty inches, do you stay with the normal rifle port location? That means two inches less of gas system dwell time. You might lack gas in some loads. Or, go with a carbine location and accept several extra inches of gas dwell time and the harsher recoil that comes with it? Stag took the 18” barrel, one that is half-way in length between a carbine and a rifle, and installed the gas block (and thus the gas tube) at the rifle barrel location. 3-gun shooters are now taking either this approach, or splitting the difference between rifle and carbine, called a mid-length gas system. With the Stag 3G, competitors gain most of the quick handling of the carbine-length barrel, along with most of the velocity boost of the rifle-length barrel, and to that they add the softer recoil impulse of the rifle-length gas system.

Stag has installed a new muzzle brake of their own design on the muzzle, their 3G comp. It is a baffled-front, vented comp with front and top ports. As with many things in competition, desires on recoil control differ, and how they are perceived can be a near-religious discussion. Comp designs are meant to work on muzzle lift, stock shove or both. This one is meant to do both, and it does quite a good job. It is also a compact comp – a good thing. In some equipment divisions, a comp over a certain size bumps you up in divisions from Limited to Open. The small size of the 3G comp will keep you out of Open, if that is your wish.

Accuracy? Is this good enough for you? 100 yards, five shots, under an inch.

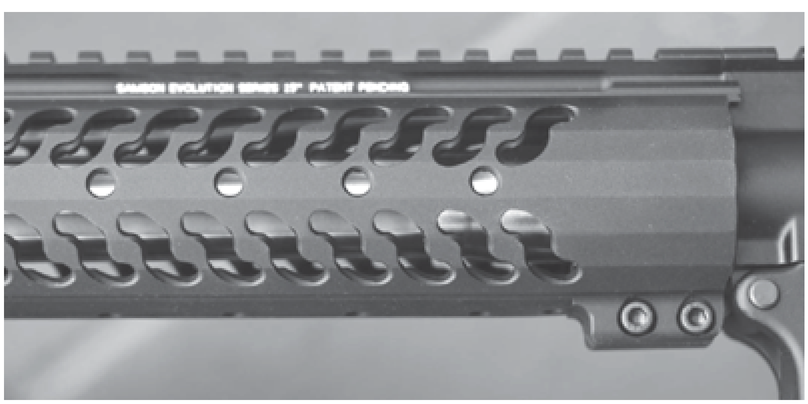
Recoil is not much from a .223, and the Stag muzzle brake eliminates the rest.

A Magpul ACS stock, for your shooting comfort.

To keep your hands from being burned by the scorching-hot barrel on long stages, Stag wraps it inside a Samson Evolution handguard. The Evolution is not your typical railed handguard. 3-gun competitors don't want acres of real estate, they want what they want, where they want it. And where they don't want rails, they want the handguard to be slim for fast handling. So, if you want extras on the Evolution, you simply bolt a section of rail there, and nowhere else. The rest of the handguard is easy to handle, even for those with average or small hands.

Now, if you like the Samson Evolution handguard but you already have a perfectly fine AR (how can this be, you don't have the Stag 3G yet, right?), then you can install one yourself. You'll have to remove the old handguards, and depending on what front sight is there, maybe it or the gas block too. Then, the delta ring, which can, instead of unscrewing the barrel nut, be removed by simply cutting the delta ring, spring and retainer with a cut-off wheel in a dremel tool. Then you simply slide the Evolution over your barrel and clamp it down onto the barrel nut. In the end, the easiest way to get the Evolution on is to build the upper from parts, using the Evolution as your handguard.

3-gun shooters do not know what the problem will be until they are in the match. High Power shooters know the distances: 200, 300, 500 and 600 yards. Varmint shooters don't have to worry about distance, the prairie dogs will wait while they adjust. 3-gunners can't wait. Close-range sights are coarse for long range. Long-range sights have too much magnification for close work. So Stag offers the 3G with Dueck Defense RTS iron sights as an option. Barry Dueck designed his sights with one idea in mind: quick transition. The sights are at a thirty-degree angle to the normal sight axis, off on the right side. After you have mounted a scope or red-dot optics, the irons are still there, but off to the side. To use them, you simply twist the rifle thirty degrees counter-clockwise, and the sights will be right where you need them.



The Samson Evolution handguard is trim and light, insulates your hand reasonably well (an aluminum tube can only do so much), and still allows you to attach rail segments where you want.

Barry didn't invent the idea, it has been around for decades. What Barry did was make them solid, click-adjustable and easy to install. I much prefer sights on the side, like this, than extra sights up on top of the scope, where I have no chance of a cheek weld when attempting to use them.

So after you've hammered out half a magazine of ammo on targets from "hard off the muzzle" to twenty-five yards, you turn a corner and have to hit a gong at 300. At close range, you need the quick handling and soft recoil of the comp and gas system to shoot "splits" (time between shots) less than two-tenths of a second. A magnifying scope may be a hindrance, but wide-open irons will be wicked fast. And then, you need to be able to hit an eight-inch gong at 300 yards. For that, you'll need 2MOA accuracy or better from a smoking-hot barrel, and a scope with a crisp image. 1MOA would be better yet.

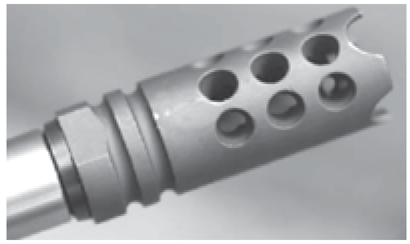
A bolt gun shoots groups as small as the Stag does, maybe even better. A generation ago it was common, and indeed in some gun clubs still is, to be sitting down and firing five-shot groups as the be-all and end-all of club competition. However, younger shooters want more, and clubs keeping up with trends offer more.

All practical shooting matches, be they USPSA, ACTS, zombies or "outlaw," have some common features: they are accuracy-intense, scored against the clock and unforgiving of malfunctions. If you get a chance to watch, you may think that the competitors are simply hosing out large amounts of ammo. Lots of shooting, yes, but they have to hit to score. Misses are not only lost points, but in some matches they are penalty deductions as well. Each stage (a match may have 2-10 stages, depending on the size of the club) is scored both by the points you shoot and the time it took you to shoot. Just like in real life, faster is better. If you have a malfunction the clock keeps ticking. No timeouts, no raising your hand for the Range Officer to assist you. It's just you, the malfunction, the stage and the

clock that keeps on ticking.

A 3-gun option, the Dueck Defense sights are offset. Rotate the rifle to use them. With even a little practice, it becomes very fast.

The 18" barrel is stainless with a 1/8 twist and match grade. You will not lack for accuracy.



The muzzle brake was a little too effective for most of the loads I tested, but that just gives you room to tune it to your favorite load.

In the course of testing, I put the Stag 3G through the "Mad Minute" stage that I used in the barrel-heating chapter. Well, I had a curious a problem: the compensator on the end of the barrel was a little too good for most of the loads I had available. With some loads it actually pushed the muzzle down off of the target. This is a good thing for the most part, as it gives shooters "elbow room" to tune their ammo to the comp or the comp to their ammo. For me, it meant digging into the ammo bunker to find some old and mild practice ammo to get the comp working just right. With that ammo I was able to come close to, but not match, my old score. Back when I set that mark, I was wearing out AR barrels at a regular pace. These days, I don't get so much practice, so a rifle that lets me make up a lot of that lost practice ground is a very good thing. Of course, were I to practice, I'd have the old skill and the new rifle, which would serve me well in a match.

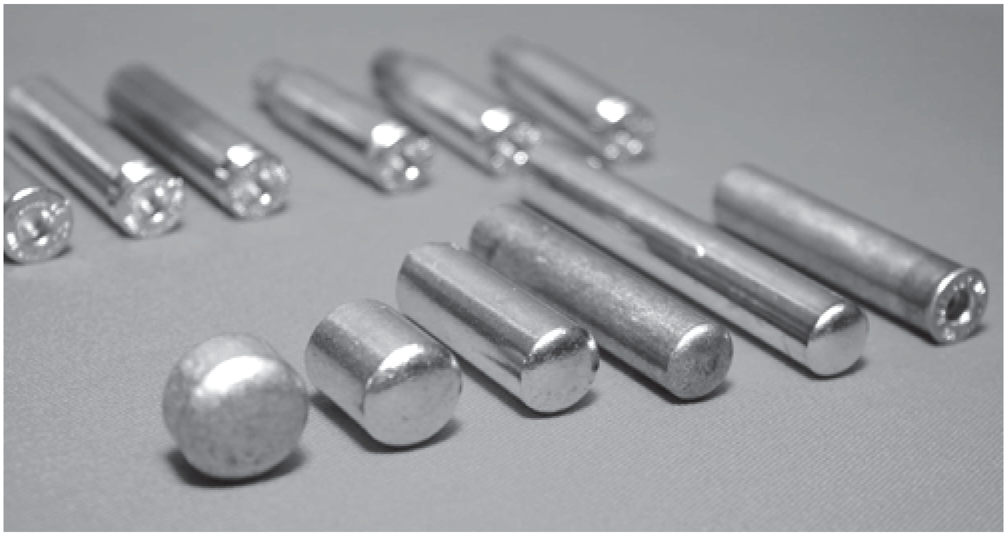
So there you have it, a base gun at a smokin' price and ready to go. If you want to shoot High Power, well, this won't work as a Service Rifle. But as the basis for a non-service, over-the-course rifle, it would do you well. It would not lack accuracy, trigger quality or reliability. You could learn a lot, and use it as a base gun to determine exactly what features you wanted on your rifle next season, when you'd have to rebuild it anyway. (NRA High Power shooters can put a lot of ammo through a barrel.)

Varminters rejoice, this will shoot fragile varmint bullets superbly. It will hold zero even when smoking hot. It is dead-simple to mount a scope on it, and the trigger will not hinder your efforts at rodentia eradication.

Hunters, one question: does the DNR permit 5.56? If they do, then load up an accurate load with a bullet tough enough for deer (might I suggest the Asym heavy all-copper bullets) and be ready for opening day.

.223 VS. 5.56: WHAT'S THE PROBLEM?

When a box or factory round is marked 5.56, it is a round that really needs a 5.56 chamber. A .223 chamber may get you in trouble.



It takes a number of steps to craft rifle brass. When it comes to .223 vs. 5.56, the 5.56 gets two stamps onto the head, to harden it more.

To a whole lot of shooters, ammo is ammo. If it fits, it shoots. They tend to be the guys with seriously tired, worn or even busted firearms. They also tend to focus on the wrong thing. You know, the guy who scrubs the brass marks off his ejector lump, at least until one day his rifle stops working or breaks into many pieces.

The .223 and the 5.56, while almost identical, are not the same. To know why, we have to go back to the beginning.

The early 1960s were an interesting time. The returning GIs from WWII and Korea had a decade to get things the way they liked. Two of the things they liked were varmint shooting and benchrest. Varmint shooting was simple. Various members of the rodentia clan, going about their usual business in a field or pasture, served as animate targets. Given that there were many of them, and they were prolific breeders, there was no limit, no season, no quitting. You could shoot all day if you wished. Well, as much as shooters then and now like to shoot, shooting varmints with a .30-06 was just silly. The recoil would beat you up, the noise was alarming, barrels got really hot really fast, and the cost of ammo, even back then, was just off the charts.

So they went down in caliber until they found that various rifle cartridges using .224” bullets did the job nicely.

Benchrest shooting was a refinement and variant of target shooting. Instead of trying to coax all the shots into a ten-ring, the group *was* the score. The smaller the group, the better the score. Again, smaller was better, and the common .224” diameter bullet served well.

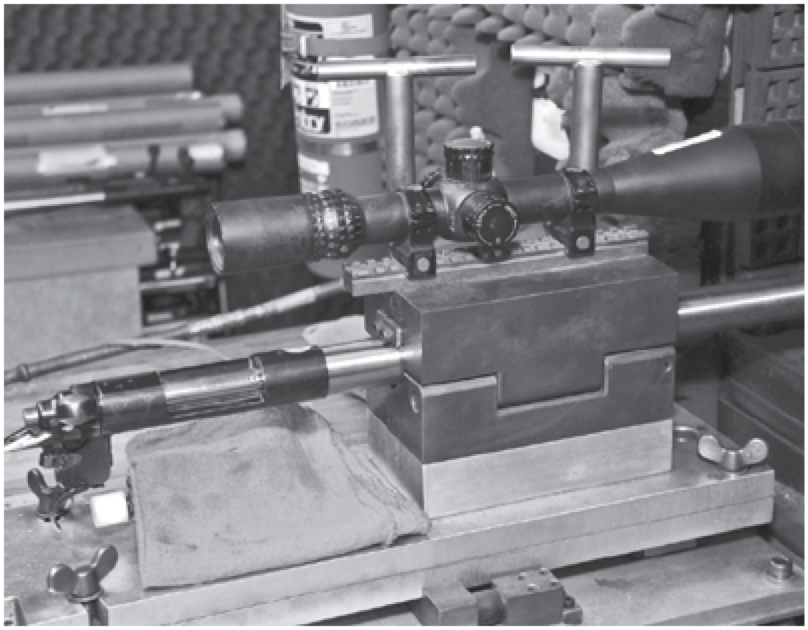
The premier cartridge in the early 1950s, when varminting and benchrest got started and began revving up, was the .222 Remington. Introduced in 1950 in the Remington 722, it was superbly accurate, and the rifle was also a brilliant out-of-the-box shooter. The mild recoil would not cause a benchrest shooter to have aiming problems, and the mild report, efficient powder charges and low bore erosion made it a useful varmint cartridge.

For those who needed more reach in the varmint fields, Remington came out with the .222 Magnum in 1958, offering 2-300 fps more velocity than the little .222.

Now we shift gears from varminting to the on-going soap opera of the US Army rifle situation. Having spent a decade and millions of taxpayers dollars, the US Army Ordnance bureau has brought forth….an improved M1 Garand. And so screwed up the process that they can’t even produce rifles quickly enough to arm the US Army in any reasonable time frame. I once looked into the numbers and came to the conclusion that, at the rate the US army was buying and building (the US arsenal at Springfield was still open then), the entire US Army would not have been switched over to the M14 before the bicentennial. For those who do not remember that occasion, it was held in 1976.

While it is comforting to read what is marked on the barrel, you can't always believe the chamber designation. You have to do as Reagan advised: Trust, but verify.

Each pressure barrel is clearly marked as to what it is, and its use is meticulously tracked and recorded.



If you are testing accuracy and pressure, you need a setup like this. Lacking this, your efforts will be a bit less precise.

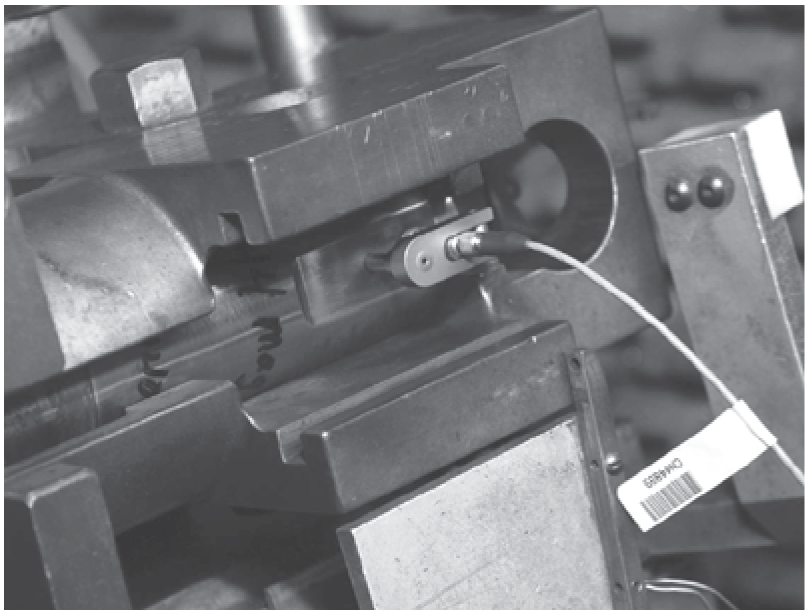
So, the Army finds in the mid-1960s that the Armalite rifle is one that could actually be forced upon them. They pull out all the stops and do everything they can to prevent this. “Real men shoot .30 rifles” was the prevailing ethos of the day. (And in some circles, still is.)

The cartridge the Armalite rifle was chambered for was the “.222 Special,” a case halfway between the .22 Rem and the .222 Rem-Mag. It also split the difference between them in velocity. The Army, recognizing an opportunity, first accepted the velocity as sufficient. Then, they upped the stakes and insisted on better and better down-range performance. Basically, they kept asking until they had exceeded the pressure limits of the .222 Special.

Except, pressure is not simply velocity-dependant. The designers managed to meet the velocity specs, and the rifle was adopted. I have, in less than seven hundred words, summarized years of work, a hundred thousand man-hours of engineering, manufacturing and range testing, and we’ve only begun.

Now, remember the beginning? Accuracy was king. To shoot small groups, or shoot small vermin in the middle of a field, you

need accuracy. Part of accuracy is the shape, and dimensions, of the entry of the bullet into the barrel. In order to make the .222 and .222 mag as accurate as possible, the Remington designers made the leade short and the onset steep. With that in mind, we'll back off, tack around and come at this from a different direction.



A close-up of a pressure barrel in place, ready to start recording the events of the day.

The Bullet's Flight

The primer goes off and the powder is ignited. Except that, in the sub-millisecond time frame we are about to enter, it doesn't. What happens is, the primer goes off and ignites the powder at the back of the case. The powder burns forward, but as it does, it expands (it has to, the gases generated by combustion are the whole reason we're doing this, right?) and pushes the yet-unburned powder ahead of it. Now, in a handgun, the powder combustion happens (in some calibers) so quickly that the bullet does not have time to move before the powder is consumed. In others, the bullet begins to move but has not left the case before combustion of the handgun powder charge is completed. In rifles, that is not so much the case. In fact,

in some rifles the bullet has moved a lot before the full powder charge has been consumed.

So, like a champagne cork popping out of the bottle, the bullet pops out of the case, with the expanding gases and unburned powder behind it. It travels forward of the case, in a section specially reamed for it. That section is some small amount larger than the bullet, but smaller than the case neck.

At some point forward of where the case neck ends, the rifling begins. The distance between those two points is called the freebore. As in, free of rifling and at bore diameter.

The bullet pops out of the case and slides forward until it comes to the rifling, where it stalls. That’s right, the bullet slows down. Hey, it got popped out of the case and was sliding forward with little friction. The rifling intrudes upon its course, and in order to move forward the bullet has to be impressed by the rifling and begin to spin. What it does is slow down, and skid a bit as it begins to spin.

The pressure builds up until it is great enough to push the bullet forward. When the bullet stops, what happens? Since the powder is still burning and the bullet has slowed down, the various gas laws (Boyle’s, Charles, and Gay-Lussac, mostly) tell us one thing must happen: pressure must increase.

Two dimensions control the pressure spike in this scenario: the length of the freebore and the steepness of the onset angle of the rifling. Obviously, if you start at a lower pressure you will have a lower peak on the spike, but the increase will be the same, regardless.

The Ned Christiansen .223 to 5.56 reamer, ready to upgrade a chamber.

No need to remove the barrel from the upper, the handle is also the guide and centering fixture.

As with .223/5.56, there is a difference between 308 and 7.62. The manufacturers are being as clear as they can when they mark their brass.

We can decrease the height of the pressure spike if we move the onset of the rifling forward and make the ramp that guides the bullet shallower. And that is exactly what the designers did back then, to meet the Army requirements for velocity and range. So far, so good.

Then, the ammo makers, in search of more performance, went looking for extra fps to be gained. I was shooting .223 and 5.56 three decades ago and the difference wasn't so great back then. I don't know if it was because the ammo we laid hands on was rejected for low velocities, poor storage, or there just wasn't as much difference then. But now, there is.

If, in the early 1980s, you had told me that a 16" carbine could deliver 3200 fps from a 55 grain bullet, I'd have looked at you as if you had grown horns. That was what a 20" barreled rifle did, on a good day. But ammunition these days does deliver that. I've seen 20" rifles do over 3300 fps with XM193 Federal ammo.

Now the problems begin.

There is a recognized situation in engineering where designers put more safety, more margin, into a system. And the end users then use up the extra margin to bring themselves back to the level of risk/use they were accustomed to. A good comparison is anti-lock brakes.

Back when brakes were just brakes, people kept a certain distance between themselves and other cars. After all, you needed it in case you had to stop. Add anti-lock brakes into the mix, and after a while people drive at shorter intervals. They can, because the car will stop faster/sooner and they don't need as much margin.

What happens if you put them back driving a car without anti-lock brakes? (If any exist any more.) If they add margin, they're fine. If they don't, and something happens, they are crunched.

And exactly that has happened with the ammo and chambers.

The extra velocity comes as a result of the lowered spike from the longer leade, and when you suddenly "take out the anti-lock brakes" you get not just the old spike, but an enhanced one.

The Details

Before we get too deep into this, you also have to be aware of a change that happened in our lifetimes (well, the lifetimes of the old farts among us) and that is the change in measuring. If you have an older reloading manual, you'll see the measuring units denoted in C.U.P., and in some older manuals "CUP" and "PSI" are used interchangeably.

The military, police, and you all require ammunition to perform exactly as expected.

The old method of pressure-measuring was known as the “copper crusher” method. Here, a test barrel would have a hole drilled through it. The diameter and depth of the hole was carefully drilled to a specified set of dimensions. Then, a little copper cylinder is clamped in place over the hole. When the round is fired, the copper cylinder gets hit with the pressure and is compressed. By measuring the length of the cylinder before and after, ballisticians could determine the peak pressure. This was known as “copper units of pressure” or CUP, but was often expressed in pounds per square inch, or PSI.

The copper (and lead cylinders, used for lower-pressure calibers) could only tell us what the peak pressure was, not how fast its onset was, how long it lasted, etc.

Today, transducers, or strain gauges, are used to measure pressure. Here, the gauge, which is essentially a transistor (it is more complicated than that, but we’re discussing firearms, not electrical engineering) is fastened to the barrel. When the gauge is stressed, the electrical resistance of the gauge changes. The beauty, and the problem, with this method is that it is dependant on a computer or other recording device. Depending on how much you spend, you can record the pressure of the event hundreds, thousands or more times per second. This caused problems in published loading data.

Let’s construct our own cartridge, just so we can remain theoretical for the moment. The .30 Zoomer Magnum has a Maximum Average Pressure (the allowed peak) of 50,000 CUP. We use the newfangled transducer to measure the standard, reference load (in this case, 42 grains of XYZ powder, under a 183 grain softpoint) and come up with 57,000PSI. The “new” MAP for the .30ZM is now 57,000PSI, where before it had been 50,000CUP.

The actual pressure has not changed, we are simply using a new yardstick to measure with. Then, we run into problems. In checking loading data, we find that some of the data wasn’t as “clean” as we thought. An example: using 123 Powder under the same 183 grain softpoint, we had found that we could get 100 fps more and still

only see 50K/CUP pressure. With the new transducer, seeing things in thousandth of a second slices, we see that yes, the main pressure peak is only 57,000PSI, the allowed max by the new yardstick, but we see a second, higher, spike from the bullet hitting and stalling in the rifling. That spike comes in at 63,500PSI, over the maximum allowed.

So we have to throttle back the load data, and all of a sudden 123 powder loses its 100 fps advantage.

The problem came from the copper cylinder not being sensitive enough to register the second, over-max pressure spike.

No, we have not "slowed down the load data to satisfy the lawyers." We didn't know we were going over-max before. We do now. We have to adjust the data.

Just to add to the confusion, where you place the transducer can also have an effect on the pressure you measure.

The SAAMI-spec pressure ceiling, the Maximum Average Pressure allowed for the .223, is 55,000PSI. No, there is no handy-dandy formula that lets you "convert" old copper-crusher pressures to PSI. The ballisticians tried, and they tried really hard, to come up with a conversion factor. The trouble they ran into was that every cartridge seemed to have its own factor. It was bad enough converting from CUP to PSI, but trying to tell people (and this is just an estimate, don't use these as numbers to go by) that where they could use a plus 12% CUP-to-PSI factor for the .293, the .34-06 used a plus 15%, and the .305 used a plus 9%. (And yes, I deliberately used nonsense calibers. Don't try to decipher them, there is no pattern, nor useful info except what I just told you.)

There was no way to formulate an equation for a "universal translator," CUP to PSI. Give it up, forget the conspiracy theories your gun club buddy tells you, just accept the new info for what it is.

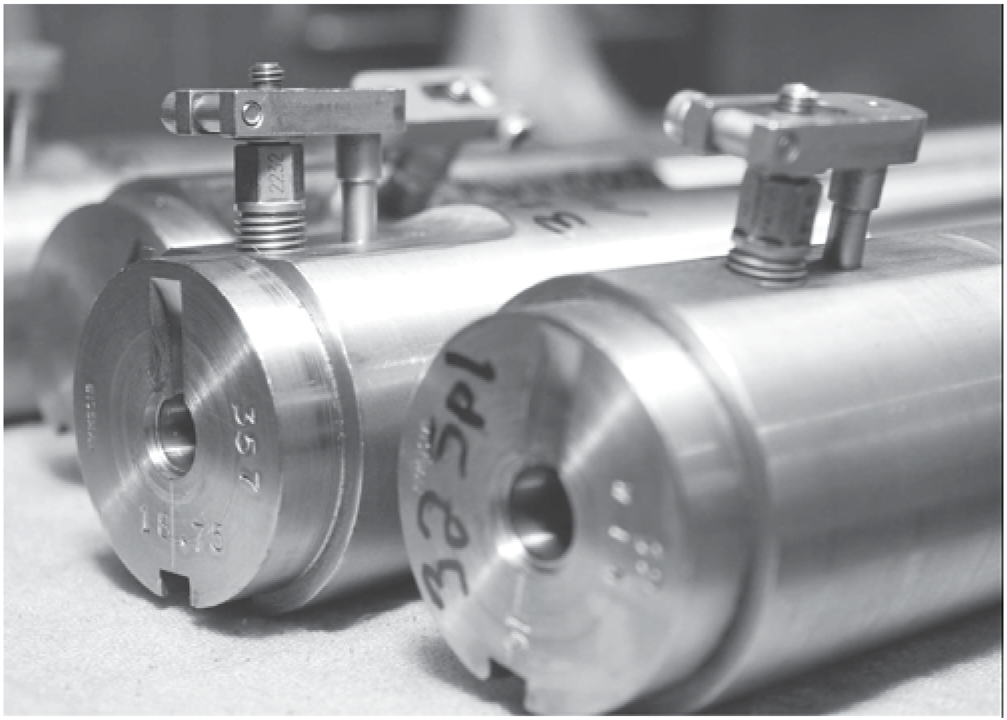
The NATO spec for 5.56 has a higher "ceiling" but is also measured slightly differently, and again, there is no handy-dandy conversion. The SAAMI method measures pressure at the middle of

the case. NATO (the European measuring group is known as C.I.P.) measures at the case mouth.

A CIP-spec 5.56X45, measured at the case mouth, shows a pressure of 62K. Measured at the case middle as SAAMI does, it shows 60K of pressure.

But the problem isn't just pressure. That CIP pressure of 62,000PSI? It is measured in a 5.56 chamber. If we take the same round, which shows 60K PSI/SAAMI (already 5,000 PSI over the .223 max) and put it into a .223 chamber, things get ugly. Really ugly, and really quickly. The pressure spike piles onto an already over-pressure round. I've talked to professional ballisticians, guys who use million-dollar labs to measure ammo for their ammo manufacturing bosses. (You know, those guys with the computers and transducers than can measure pressure by the thousandth of a second or finer.) They have reported some instances of 5.56 ammo in .223 chambered pressure barrels demonstrating peak pressures at or above 75,000PSI. That is the pressure of the proof load each rifle gets tested with at the rifle maker's, before shipping.

Three sectioned chambers, to show the differences between the types.



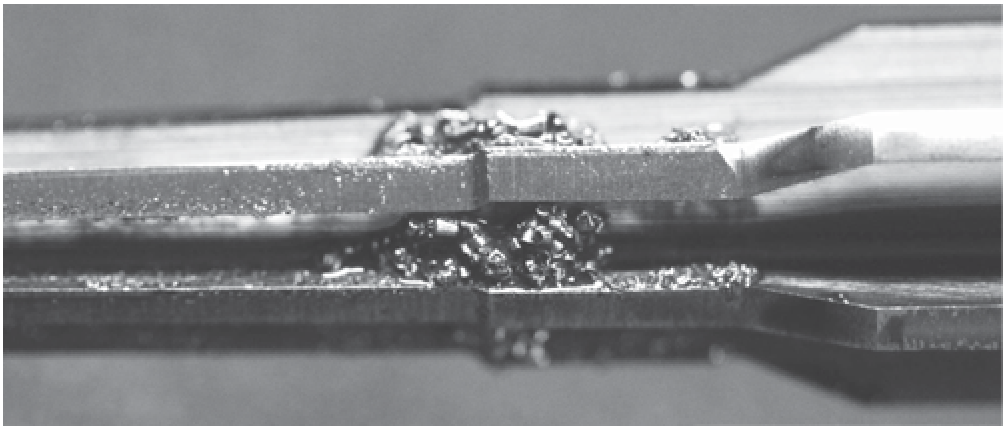
The location of the transducer is precisely defined and meticulously placed. Barrels are carefully stored, and their service life recorded.

Proof loads, for those who aren't remembering, are the deliberate, plus-30% loads that each rifle maker fires, once per, in their rifles before they ship them. They do so in the full expectation that the rifle will do just fine. Once. More is abusive, stupid and asking for trouble.

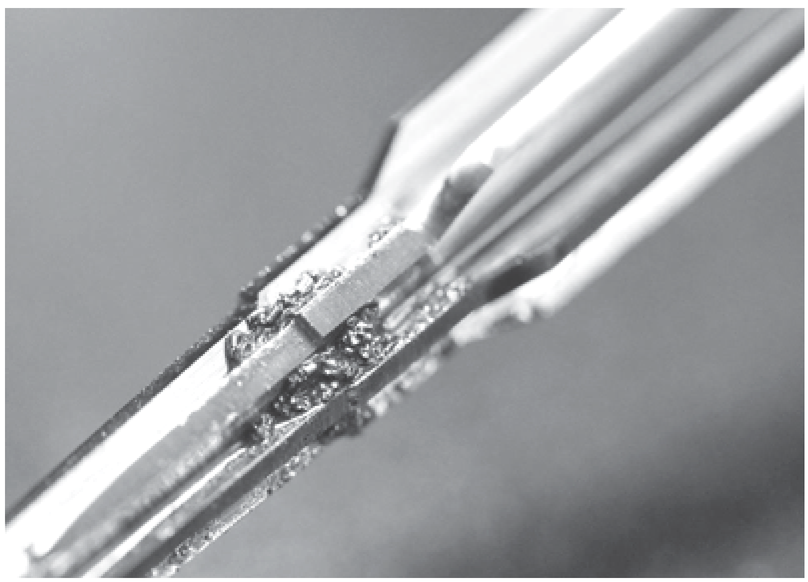
At this point, many an advocate of "there is no difference" will say "I've shot thousands of rounds through my AR and it hasn't given me any problems." I've worked in gun shops for too many years to accept round-counts mentioned across the counter at face value. Nothing personal guys, but the true number of rounds fired is typically a quarter to a tenth of the asserted number. I teach law enforcement patrol rifle classes in the summer, and I see how much work (and have done it myself) it takes to run 1,000 rounds through a rifle. If your buddy says "Yea, we went to the range this weekend and put a thousand rounds through each rifle," he's exaggerating. And if he isn't, you do not want to borrow any of his rifles, as a thousand rounds in two days is enough to smoke the barrel.

Also, most shooters haven‘t fired enough real 5.56 ammunition to actually test their rifle. Almost all the “generic” ammo you shoot is not 5.56. Oh, it says “.223 Remington/5.56” on it, but it isn’t really 5.56. The high-volume, low-cost bulk ammunition that most of us use is not loaded right to the red-line. I’ve chrono’d enough of it to know that much of it falls 100-200 fps short of full-book 5.56 spec. That right there is enough to make it no big deal chamber pressure-wise, because the peak pressure of the .223 load is sufficiently less than that of the 5.56, that the artificially-induced spike still falls below the pressure ceiling.

Hours in making, days in shipping, months on the shelf, a moment to expend and perhaps a lifetime hanging on the results. Ammo makers know this and make the best ammo they can.



Here we see the chips from a 556-marked barrel that obviously wasn't.



On a good .223 barrel, the reamer will only remove steel in the neck and throat area. It stops when it is done.

The extra pressure produces faster wear on your rifle. Since most shooters don't shoot enough to wear out their rifles in any reasonable time-frame, the extra wear is hardly noticed. But you can have a serious problem if the variables stack up against you in a range session. Rifles get hot when you shoot them. They also get hot in the summer, in the heat and the sun.

So, there you are on a hot summer day, shooting your supply of real-deal 5.56-spec ammo through your .223-chambered rifle. The

summer sun beats down and pressures rise. Black rifles left in the sun can easily reach 140 degrees even before they are fired. Add to that the temperature increases from shooting and you have some real heat problems coming on. Let's make it worse: the particular lot of your 5.56 ammo is at the top of the allowed pressure and at the bottom of the allowed brass hardness. The ammo maker tested it in a 5.56-chambered test barrel, and while it is in the top end of the allowed specs, it is within the safety margin.

You're having a blast, when all of a sudden your rifle stops working. What happened? The heat increased the already maximum-made-excessive pressure, and on extracting a fired case, the pressure had expanded the case enough for a primer to fall out of the primer pocket, but into your rifle. Actually, it probably (if you pick up and inspect all your brass) has been losing primers for the last couple of magazines. One or two primers per magazine. But it wasn't until one fell into your action and tied things up that you noticed.

How bad can this get? In a patrol rifle class last year a police officer was pushing his safety back to Safe (and the selector was resisting) when the rifle suddenly spat out a three-shot burst, then stopped working entirely. He'd blown a primer, and the anvil of the primer had wedged under the trigger in just such a way as to create the burst. Typically, the primer wedges under the trigger in such a way as to keep the rifle from shooting at all.

Solving the problem

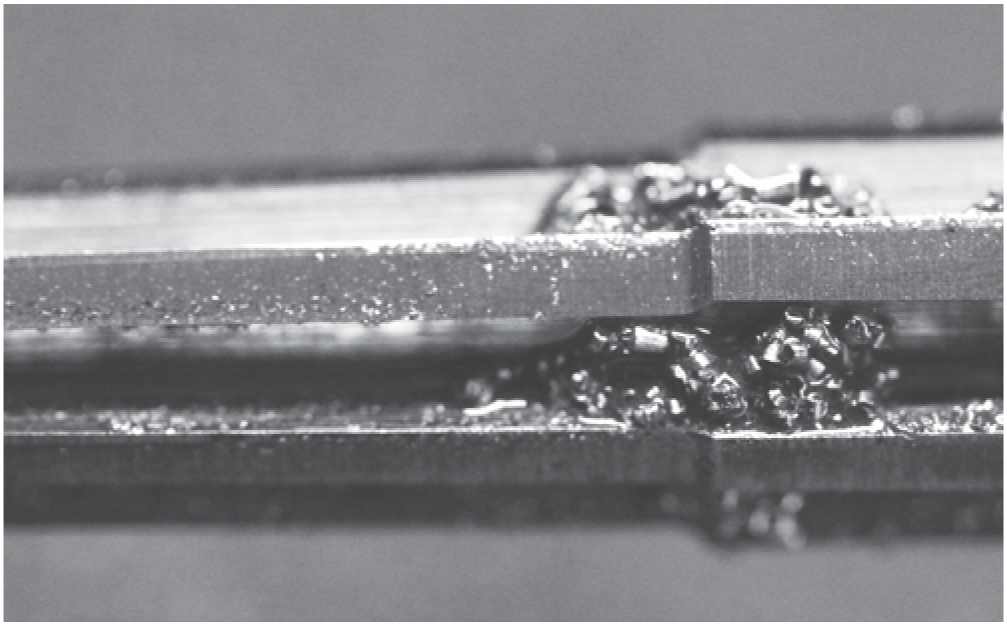
One solution would be to only use .223-spec ammo. That can be okay, but if you find a deal on 5.56 ammo, it kind of makes no sense to buy a "deal" that you can't use. Also, some of the best ammo for some applications is 5.56-only.

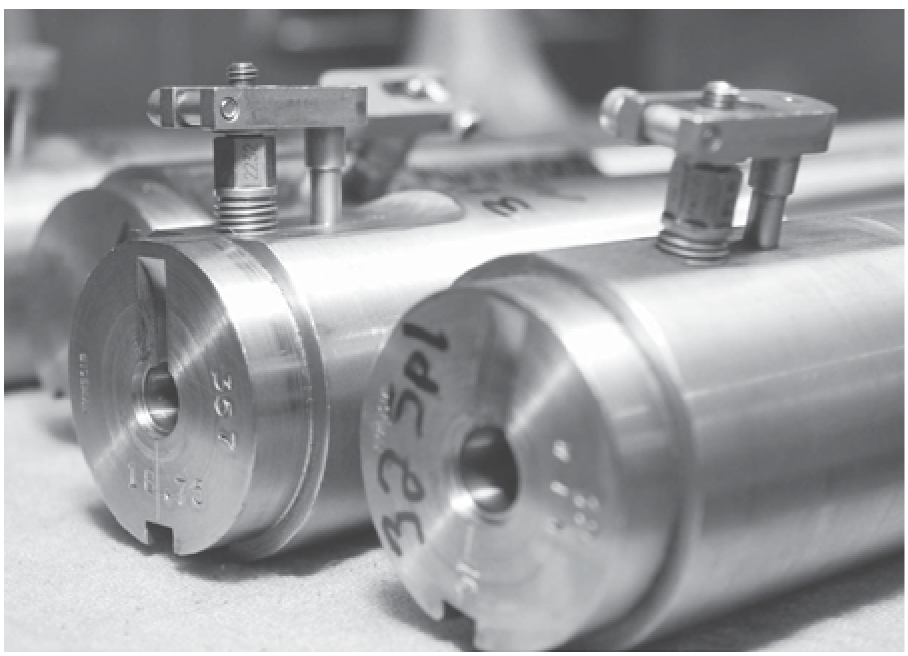
Plus, you can't control the outside temperature, and how much ammo you may need to fire. It would be nice to have a rifle that handled 5.56 with aplomb. But how? First, you have to be able to measure what is there.

The first thing you have to know: this isn't headspace. A headspace gauge only tells you the dimensions of the shoulder and case body, not the neck and leade. You need a leade/throat gauge, and for that you need to get a .223/5.56? Gage from Michiguns (www.m-guns.com). I have to be up-front and tell you that I have known Ned, the inventor, for nearly 30 years. I don't get anything but thanks from him for recommending his great gizmo, and I think it is useful enough that I'd recommend it if I didn't know or even like him.

The gage is simple: it is ground to just under the maximum specs of a 5.56 leade/throat. Drop it in, and if it drops free, you have a 5.56 leade. If it sticks (it is hardened steel, don't pound it in) you have a .223 leade. If you're curious, and want to know just where it is catching, you can mark it up with a felt-tip pen, and with a little careful turning (clockwise) you can see where it rubs.

If you are really curious, browse through your Brownells catalog (you do have a Brownells catalog, don't you? You don't? Get one, before you get severe deductions from your man-card.) and order Cerrosafe. Cerrosafe is a special metal alloy with a low melting point. You push a cleaning patch until it is in front of your chamber, heat the Cerrosafe, pour it in the chamber, and let it cool. Once cool, you push it out of the chamber, and you have a cast of the chamber, throat and leade. You can inspect and measure to your heart's content.





FROM LEFT TO RIGHT: The end of the leade on a 5.56-spec chamber. You can see, at the tip of the knife blade (yes, it needs sharpening) where the .223 leade ends. Pretty short, eh? A .223 chamber reamed to the 5.56 NEMRT, as done by the Ned reamer.

So with the gage or Cerrosafe you find that you have a .223 chamber, and you wanted a 5.56. If the rifle is still brand-new, you can send it back. However, the maker probably only has more

barrels of the same kind from the same maker, and you may not get a 5.56 no matter how many times you ask. So, you need a specialized reamer. One that cuts the leade, and the leade only. (You don't want your headspace changed.) Ned makes that, also. "But, I have a chromed barrel, I don't want to cut the chrome." Okay, stick with a chromed .223, that's fine. But, if you want a 5.56 leade, yes, the reamer will remove chrome. But guess what? The area being cut is the area where the chrome is blasted off first, so if you've put more than a few hundred rounds down your barrel, there is probably not much chrome left there anyway. Especially if you did rapid-fire shooting or heated the barrel up to the point where you had to wait for it to cool.

And, in all fairness, you don't have to have Ned's reamer. The various reamer makers will be happy to supply you with a 5.56-spec finish reamer. You just have to be aware that a finish reamer will also ream the shoulder if you aren't careful. You may go in attempting solely to make a 5.56 throat and end up creating excessive headspace along the way. Ned's reamer does not cut on the chamber shoulder at all, so when you feel it stop cutting, you are safely done. It also makes a leade longer even than that of 5.56, by a small margin.

"But my barrel is marked 5.56, I can't have a problem." Alas, that is not the case.

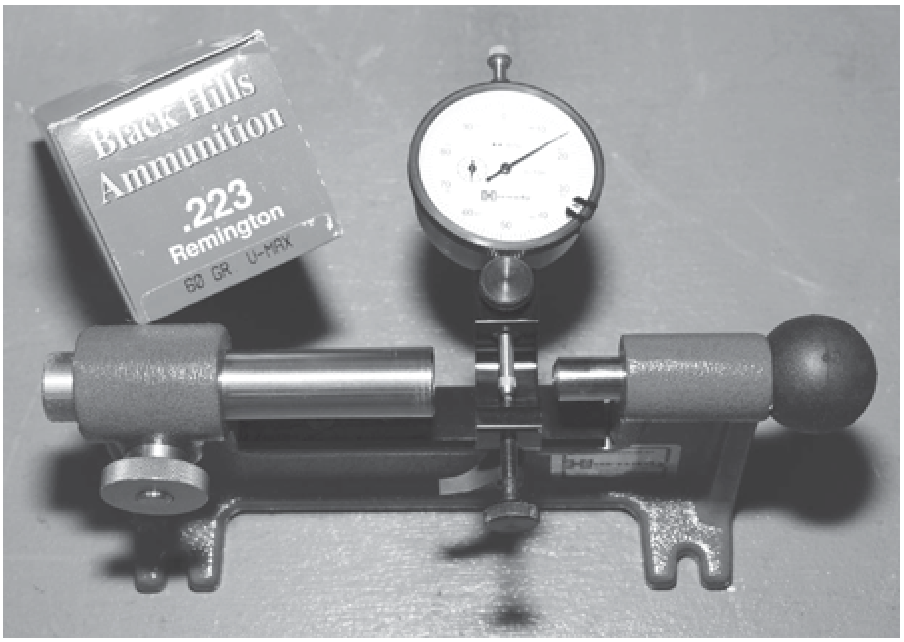
At the latest LEO patrol rifle class, I chamber-gauged the two dozen rifles officers had brought. All but two were marked "5.56." One of those was an M16A1, and the other had a completely unmarked barrel. Of the 24 rifles, six failed the .223/5.56? gage test. Two of those were not just .223-chambered, but clearly on the small side of the dimensions, as I had to use force to remove the gage. How can this be? Remember how barrels are made. The manufacturer uses a chambering reamer to turn the chamber out of the back and of the barrel blank. As reamers dull, they are re-sharpened. Sharpening makes them fractionally smaller. Reamers start at the maximum size, and as they "shrink" from repeated sharpening, the chamber they cut changes. Once they get to the

minimum, they are discarded and a new reamer used. Well, some use reamers for a bit too long, and the chamber cut can be at minimum or smaller dimension.

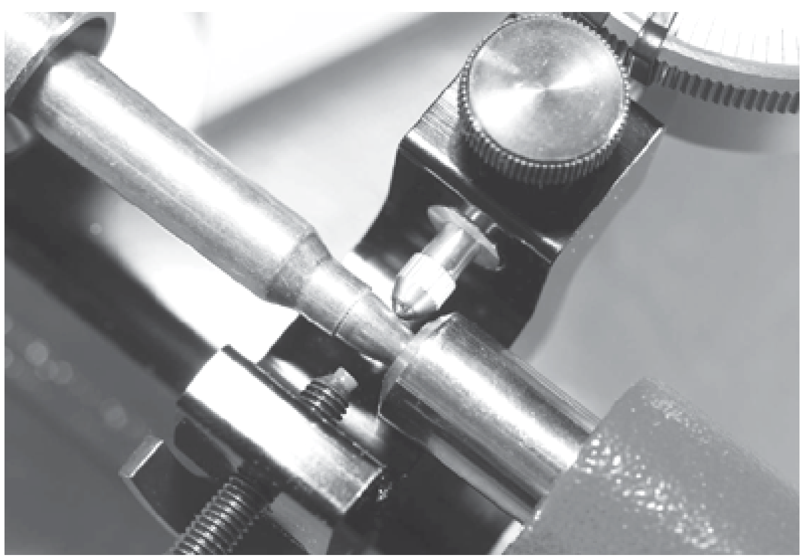
Of those six that failed the gage, three ended up showing pressure signs later in the class, so we reamed them with the M-Guns reamer and those problems went away. Two of them were the markedly undersized barrels. The other barrels/rifles continued to work, but for how long? They may have been getting fed .223-pressure ammunition, and thus would not show pressure signs.

Having a .223 chamber in your AR is a greater concern than just the social ostracism of having a rifle that is “not mil-spec.” However, it is something you can test, and fix, if needed. Me, I’ve long-since checked all of my rifles, and those that didn’t pass the test have been corrected.

CHAMBERING ROUNDS



Using the Hornady runout gage, I measured the runout of ammo before doing anything to them.



After chambering them multiple times, I again measured runout.

We're all told, if the instructor is switched on, to not re-chamber a round. Re-chamber? What? Simple, you load up, for the day's work, or duty, or whatever. At the end of the day, you unload and store your AR in the rack. That round that got chambered? If you're smart, it goes into a special box of "practice ammo" for use when you go to work on your skills. What it should *not* get is stuffed back into the magazine, to repeat the experience over and over and over….

That doesn't mean that everyone has gotten the memo. In police departments all across the land, the same top round gets chambered, unloaded, stuffed back on top of a magazine and chambered again. Which is actually worse than being chambered once, forgotten and not moved until years or decades later when it is called upon.

In discussing this with those with broader experience than I, I've found there are places where it is even worse. An acquaintance of mine remarked, "Some days I go from base to base to base. Every base, I unload, stuff the round back into the mag and reload when I leave. When I go to the range, I use the mags I've been carrying. I've never had a problem." This is apparently not uncommon in the dusty places of the world where we have earnest young men and women protecting us.

Why is this activity theoretically bad? When the top round gets stripped forward by the bolt, the bullet strikes the feed ramp, and that impact point is used as a lever to pivot the round up out of the magazine, pry it from under the feedlips (sideways, towards the centerline of the rifle) and then up. The abuse doesn't stop there, as the bullet then gets struck on its side as it enters the chamber, and the tip is used to center the cartridge in the chamber as the bolt closes.

I've seen high-speed video, a thousand frames a second, of ARs and M16s firing. We all like to think of the cartridge as taking a smooth, clean path to the chamber. Actually, they bounce, spiral, chatter, jump, wedge and lurch, and do everything but complain while doing the tango as they feed and chamber. It isn't pretty. The general consensus is that the bullet takes an impact, but once is no

big deal. More, and you risk loosening bullets. Loose bullets can set back into the case. A bullet that has set back has, in effect, made the case capacity smaller, but there is still the usual amount of powder in there. When/if this happens, pressures spike, and perhaps that explains some of the times rifles break into pieces when fired.

How much does it happen? When it happens, how much does it matter? Can it matter? Well, there's only one way to find out, right?

To test this, I figured I'd have several avenues to approach from. First, a bit of thought experiment, as Albert Einstein advocated. What happens when the bullet gets hammered as it feeds? Well, the bullet gets slammed to the side. So, if we do that a few times, we could see how much effect it has, right?

Test the concentricity of the bullets, chamber them a few times, and measure the concentricity again. Known as run-out, the bullet tip being off-center is a known variable of accurate ammo. Benchrest shooters go to great lengths to seat their bullets as dead-center on the cartridge axis as possible. Factory ammo does not do as well in this department, but that is not because the factory engineers don't know how. The benchrest shooter has to first craft twenty perfect cases, and then load them for the match. He (or she, let's not be sexist about this) then has to re-load those cases enough times to get through a benchrest match. The factory has to make millions and millions of rounds.

Plus, the benchrest shooter is looking for something significantly more accurate than "only" one-quarter MOA. Center-to-center groups of 0.15" or smaller are what it takes to win. For the factory, the ammo they make is going to go into rifles that may or may not be able to shoot 1.0 MOA, and a refinement that gains them 0.10 MOA, at great effort and expense, is just not worth it.

But for us, we don't have to have ammo that is absolutely concentric, or with zero run-out, because we are interested in the before and after. So, I asked Hornady for a concentricity gauge, and they kindly sent one.

Daily searching for IEDs in Khwazha Bana village, Afghanistan. Each day, load up and exit the wire. Each night, come back and unload. How many times can the top round be chambered and still work properly?. **(DoD photo by Alicia Brand, U.S. Army)**

The second effect of the bullet being slammed, and as a direct result of the mis-alignment, is that accuracy should suffer.

A third effect would be distortion of the neck, from the bullet being slammed, whanged, torqued and abused. However, unless I was to use a minimum neck-diameter gauge, I could not tell if the necks were bent, short of it being great enough to be visually noticed. While it would be possible to track such a mis-alignment by measuring neck concentricity, that was more detail than I was willing to go to. Tracking bullet concentricity was work enough.

Fourth, if the necks of the cases are bent enough, the neck tension holding the bullet in place should change. However, this is a test that amounts to destructive testing. I cannot test a batch of bullets for neck tension, then chamber them, and check them for neck tension again. The test is simple: how much weight does it take to move the bullet back into the case, or pull it out? (The factory test is the pull test.) Having pulled bullets, I can't re-seat them and test again, they have been altered. So that is a test I cannot perform.

However, a substitute for neck pull forces might be velocity consistency. If the necks are abused enough to change the tension, then velocity might change. More likely would be that velocity would change a small, statistically small or insignificant amount, but the standard deviation and extreme spread would increase.

Finally, we have an aspect that is not unique to the AR, but one we have to be aware of: primer impact. As the AR chambers a round, the firing pin is not spring-loaded. The firing pin, as a result, leaves a small impression on the primer. If this impact is repeated, perhaps the consistency of the primer ignition might be compromised? This too, might show up in the statistical tracking of ammunition accuracy, extreme spread and standard deviations of velocities.

The military deals with these problems in several simple ways. First, they use a cannelured bullet and crimp the case mouth into the cannelure. Second, they use a compound to water-seal the case mouths, and this compound would resist changes in neck tension. Finally, they use primers that are tougher than commercial primers and crimp them in place. However, testing with military ammo is not likely to demonstrate changes in the chambering tests. Plus, the military is willing to accept ammunition that is not really all that accurate, at least not by the standards of commercial and sporting shooters. We all like to boast of our sub-MOA ARs, but mil-spec ammo is good enough if it delivers under three MOA accuracy. How much abuse would I have to dish out, in order to make a measurable change in three MOA ammo? More than I'd want to go through.

This is a test plan that is not without risk. If the necks are abused enough that neck tension changes, and as a result of chambering, a bullet sets back into the case, well, that is bad. The radically increased chamber pressure, from the decreased case capacity, is implicated in the blow-up of many a rifle. So my plan was to proceed with great caution, watching the bullets in each stage of the test, and if things got too ugly, to call a stop.

The Rifles

To test, I needed at least two rifles. One had to be an utterly standard, box-stock Colt, so there would be no question about the feeding forces generated. Lacking an unaltered Colt, I used the next best thing in my rack – my Colt MT6400C. The only things I've done to it were to un-pin the muzzle brake and thread the muzzle for a proper flash hider, and to replace the M4 handguards with a railed, free-float handguard. Otherwise, all the parts are Colt, and thus the feeding geometry and forces would be within the tolerances that Colt has established for the carbine. Now, that is no guarantee that it is anything but "within spec." That is, it could be the harshest-feeding rifle that left Colt that day, week or month. Or, it could be the softest. Only Colt could tell that, if even they could. It is not, however, accurate enough to test the ammo. Not that it isn't accurate, but I need something a little more refined and consistent for this test.

The test-fire rifle is a LaRue OBR 5.56. With the match barrel, free-float handguard and a Leupold scope on top in LaRue mounts, it has proven to be a tack-driver. To aid in the quest for accuracy and testable data, I asked Bill Gravatt of Sinclair if he had anything that might help, and he sent me a gizmo that was just out of the R&D shop. The front plate he sent clamps to the bottom rail of a railed handguard and provides a big, flat surface to ensure repeatable aiming. Combined with a buttstock bag, it should be just the thing.

To use it, I had to do two things: bolt a section of rail to the bottom of the LaRue handguard, and make an aiming plate for the shooting benches at the club. The rail was easy, I just used sections of rail I had on hand and bolted them to the bottom of the LaRue handguard. Now, my range has some oddities as far as angles and sight lines are concerned. When we poured the slab that is the 100-yard firing line, we didn't take the time to get it level. Smooth, yes, even, too, but not level. So, a bench on the line looks down on the range floor, some 50 yards out. To get the Sinclair gizmo pointing in the right direction (which is an R&D item at this point, but if it works out they may offer it in the catalog) I made an adjustable front platform. Since the Sinclair plate offers a flat surface, I took a

foot-wide board, cut to a square, drilled holes in the corners and installed threaded bushings. I now can use furniture sliders to screw up and down, to produce a level and on-target surface on which to place the Sinclair-plated rifle.

After measuring and sorting, I began the boring and tedious task of chambering them multiple times.

The Ammo

What I needed was something as accurate as possible, in good quantity, and consistent from box to box. Luckily, in the pile of ammo Jeff Hoffman of Black Hills had sent me for the abuse testing

was a carton of his red-box (new ammo, in new cases) loaded with Hornady 60 grain V-Max bullets. Superbly accurate ammo, and as it lacks a cannelure and is not neck-sealed, much more likely to show us changes from repeated chambering.

I realize that defensive ammo is likely to not be like this. You will probably be using ammunition that differs on a number of points. It is likely to be cannelured, neck-sealed and have a bonded bullet. The cannelure and neck sealant would add rigidity to the assembly and resist distortion from repeated chambering. The bonded bullet is probably going to be a bit tougher than the V-max, and thus itself be more resistant to distortion.

However, we're looking to see what, if any, changes happen with repeated chambering. To do that, we need two things: ammunition that is more likely – not less – to be affected by distortion, and we need ammunition that is as accurate as possible so we can see changes if they occur.

As an example, let's assume, for the sake of argument, that a particular bonded bullet/ammunition that is suitable for defense will shoot groups in the 1.5 MOA range. And those groups are less consistent, demonstrated by a range from 1.25 to 1.75 MOA. How many chamberings would we have to simulate, and how many groups would we have to shoot, before we could show an accuracy degradation of .25 MOA?

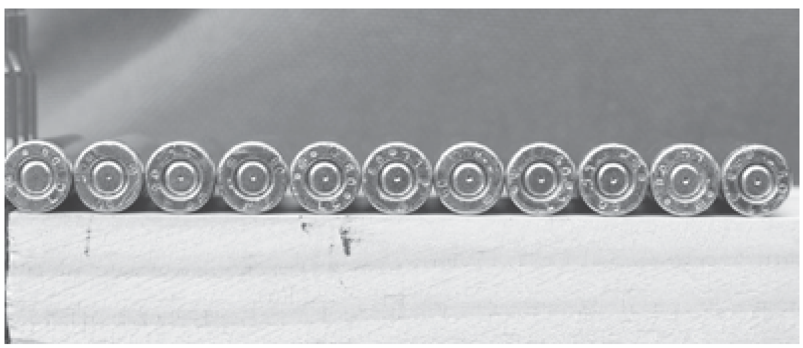
Quick answer: a lot more than I'm willing to try, that's for sure. If, on the other hand, we take ammunition that shoots 0.75 MOA, with a plus-or-minus of 0.10 MOA, an accuracy loss of .25 MOA will be readily apparent. Plus, if we do this to ammunition that is more likely to suffer, and we gain that loss (is that contradictory?) in a mere five chamberings, then we have learned something.

The Tests

First, I set out to determine just how much runout this ammo had and how well it shot. The runout was measured in the Hornady tool designed for exactly this purpose. I measured two boxes of fifty

rounds each of the Black Hills/60 grain V-Max to the best of my ability to find the largest spread on the dial gauge for each round. Interestingly, I found that the vast majority of them had runouts in the .5 to 1.5 thousandths of an inch. And from now to the end of this chapter, I am not going to try and write the measurements in their correct scientific form, as in 0.0005” to 0.0015”. Just take it from here: I'm speaking of thousandths of an inch.

The first box produced six rounds that had runouts of 4.5, but all the rest were under 1.5, so I set those six aside. Yes, in a fully instrumented, scientific examination I'd leave them in, but, we're looking to find the change here, not the change from absolutes. By leaving those six out, I will have a sample that is much more uniform and easier to “read.”



Just as a check, I chambered a sequence. From the left: un-chambered, once, twice, three times and so-on. The first chambering is easy to spot. The second and third deepen the impression marginally. Past that, no-one can tell.

The second box only produced four rounds out of the norm of 0.5 to 1.5, and those four only had runouts in the 2.5 range. What I found really interesting was that the one box had six at 4.5, and each of them measured just and exactly that. The second had four of 2.5, and they too read just that. I didn't have any, for example that measure 3.0, 3.5 or the like. Which simply proves that statistics are a funny thing.

Then I averaged the measurements. Next, I ran the second box of fifty rounds through the Colt, chambering them each five times. I

then measured the remaining rounds in the runout indicator. Now, I started with 46 rounds and ended the "five chamber" sequence with 45. Once, my hand slipped on the charging handle, and the next round to be chamber crashed into the round that had not been extracted. The bullet set back in the case, an indication to me that my choice was correct: this ammo is not defensive-oriented, but for popping pasture vermin. Cool.

Runout

The first box of ammo, once the 4.5s were set aside, had an average runout of 0.8625, which really is far too precise a number to be using, but that's what the calculator gives me, so I'll run with it. The second box of ammo has an average runout of 0.913, a slightly larger number, but one that could be explained by only half a dozen rounds having a runout of .25 each, or so. This is not a big deal.

Which made the next step so aggravating. I chambered each of the 46 rounds five times, and then measured runout again. The average had moved up to 1.036. If we assume (again, just for the sake of having something to work with) that the two measurements of runout before chambering are the extremes (as in; the .8625 is the lowest, and the .913 is the highest, and all other boxes of ammo we'd measure would fall in between them) then the change post-chambering is only one and a half times the extreme spread.

I kept a sample of the five-times-chambered rounds, and figured I could always chamber them more if I needed to, while planning extra work. For a quick test, I fired a couple of groups. No joy, the groups were no different in size or location than those of the non-chambered (well, once, to shoot them) rounds.

This is not enough to give us meaningful data when it comes time to test-fire. So, I kept the ammo already measured in the boxes, for another range trip where I could chamber them in peace and safety and measure runout yet again.

Before we continue, an interesting point. When I measured runout on the un-chambered rounds, the needle of the dial indicator would

always swing smoothly from one dimension to another. That is, if it had 1.5 runout, the needle would swing smoothly from zero, to plus 1.5, and back to zero again, as I rotated the cartridge.

Once they had been chambered five times, the movement of the needle was not at all smooth. A similar round, with 1.5 of runout, would still swing from zero to 1.5 and back, but it was jumping, chattering and generally being anything but smooth. And the bullets showed why. The ogive of each was scored by the edges of the locking lugs, and the feed ramp. I can’t help but think that the roughening of the surface is doing not-good things to the coefficient of drag, but I do not have measuring tools subtle enough to determine how much effect it has.

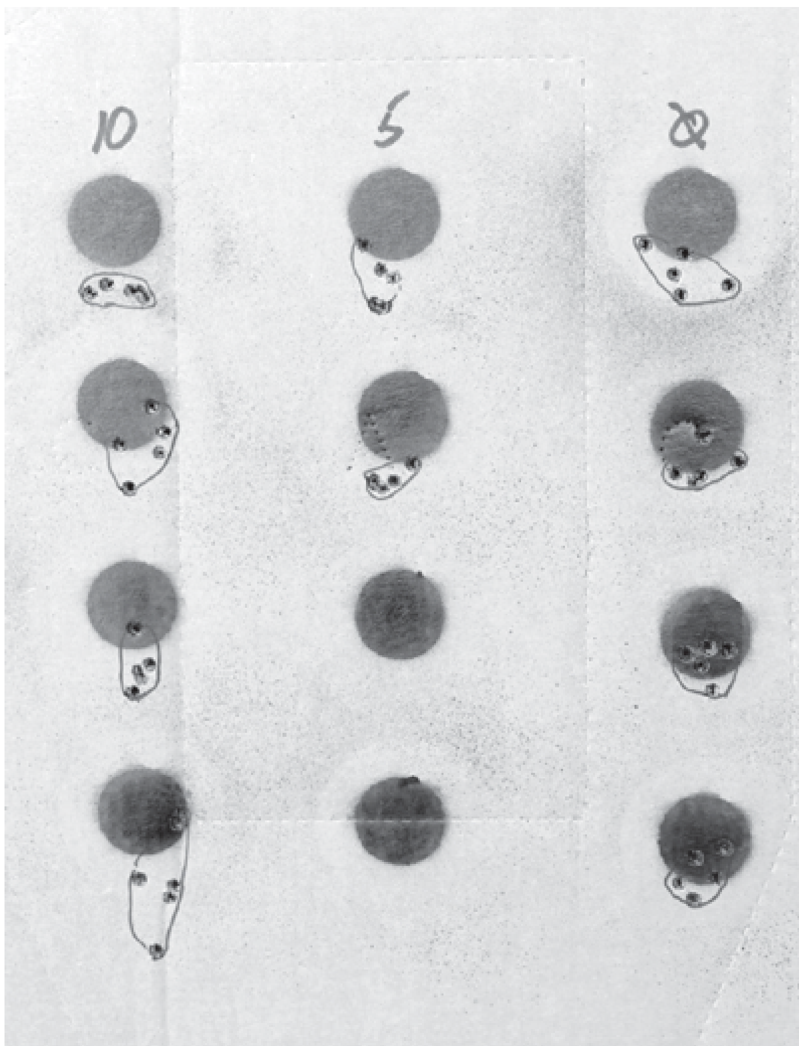
More Work

So, I then chambered a box of Black Hills ammo a grand total of ten times. Between the extreme runout rounds (I had three that showed runouts of 2.75 to 4.0) and those dropped, stubbed, or otherwise mangled by my own clumsiness, I ended with 43 rounds that had been through the chamber ten times each. The initial set, once I had thrown out the three, came out to an average right in-between those of the other boxes. This box came up with 0.8997. After I had chambered the rounds ten times each, the average had moved up to 1.110. It didn’t seem that the chambering had created much extra runout, and the extra chambering certainly hadn’t produced extreme runout.

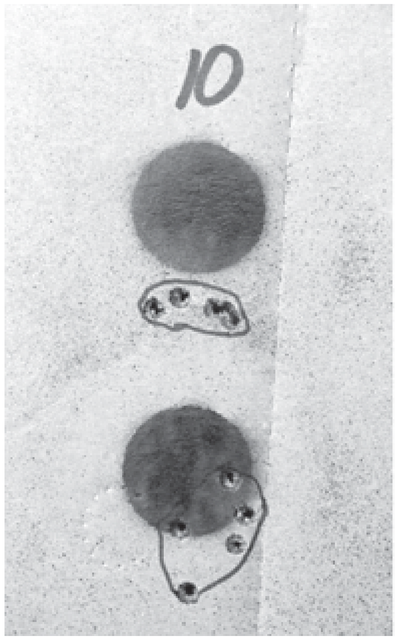
I set up the platform, bolted the rail and Sinclair adapter onto the LaRue, and shot 20 un-chambered rounds through the LaRue 5.56 OBR, to see how well they shot, in four, five-shot groups. I did a quick zero-check with a fresh box, then settled in and shot for record with the gauged, un-chambered ammo. As you would expect, the rifle shot superbly, and what few strays there are from the groups are more attributable to my dodgy shooting skills than to the ammo or rifle.

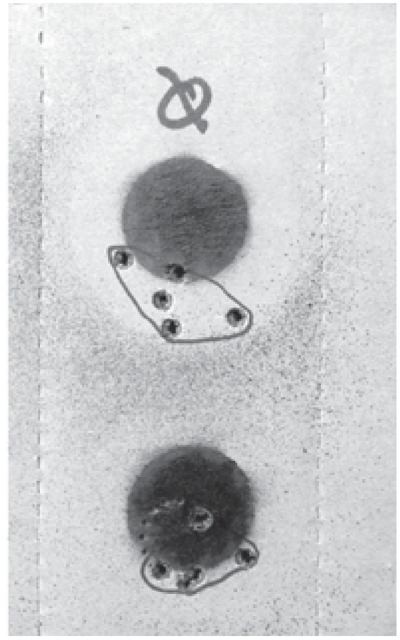
I'd like to point out that, were this an engineering-school-level exercise, I'd be using something like a benchrest Unlimited rifle, also known as a rail gun. Or, a single-shot test fixture, with a full-up weight greater than my own.

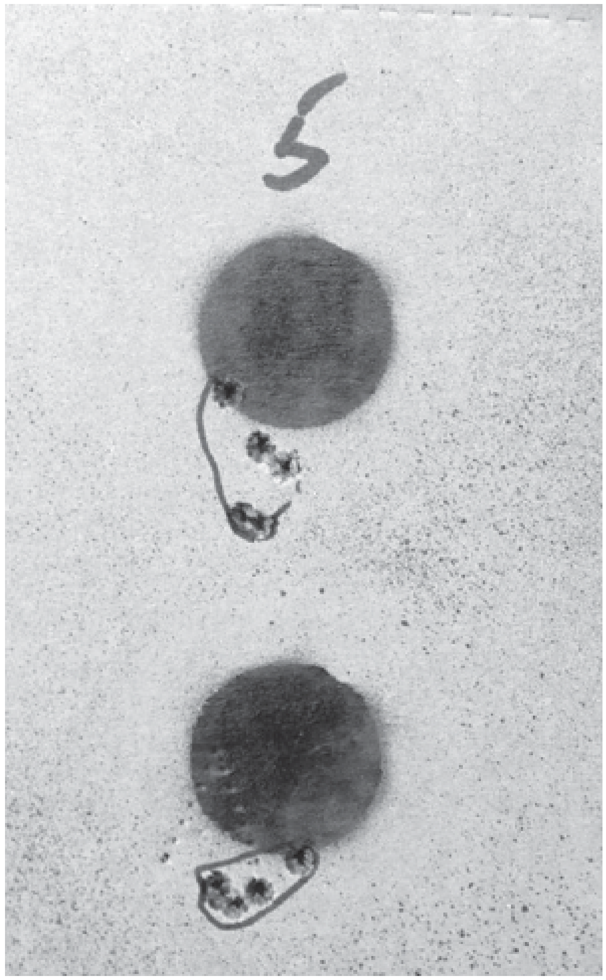
The next step was to take another twenty rounds and shoot them over the chronograph. (It would have been ideal to have both fired them for group, and fired them over the chrono at the same time. Alas, my range and chrono are not always happy with trying to accomplish this, and the results are often spotty at best.) With the runout average, the group average and the chrono results, I now had a baseline. Let the experimenting begin.



Once all the work was done, I test-fired them for group.







The largest and smallest groups of chambered-ten-times rounds. And one of those in the big group is a called flier.

A Slight Detour, For Entertainment

As I was spending quality time chambering ammo a dozen times that I'd only shoot once, it occurred to me that perhaps I could find a way to determine when a round had been chambered more than once? The initial chambering creates the tiny dimple on the primer, one that tells you "Hey, this one's been here before." So, could it be possible to tell how many times a round has been chambered, from inspecting the primer?

I took eleven rounds. The first I left alone, the un-chambered round. Then, I chambered one once. The second twice, the

third….well you get the idea. The tenth round was chambered ten times. I carefully lined them up, took a photograph (macro lens, tripod, timer) and then inspected them magnified on my monitor. The results were clear. The first was typical, the second and third chamberings created slightly increased impacts. The first was obvious, the second and third were marginally larger, and could be noted if you held them next to one that had been chambered only once. But only then. By themselves, you couldn't tell. Past the third chambering, there was no change. It was impossible to tell the difference between the one chambered four times and the one chambered ten times.

So, that would seem to make the task pretty clear, and pretty easy. If you have chambered a round once, and then un-chambered it, it goes into the "practice" pile. There, it gets chambered a second time and fired. No round meant for defense gets chambered more than once.

Back To The Numbers

However, in loading the rounds for yet another run through the chamber, I noticed something. The "teeth" of the locking lugs on the barrel extension act as guides for the round. Each one had a spiral of tiny scratch marks from riding over the corners of the lugs. Hmm. Here, perhaps, is the clue we need. If you see more than just a few scratches, that is a clue. If you see a pretty thorough pattern of swirls on the ogive of the bullet, this is a round that has been chambered multiple times.

The drudgery over, it's time to get down to brass tacks.

I set up the shooting bench, and with the LaRue rifle zeroed, proceeded to shoot groups. First I shot groups with the gauged, sorted, but un-chambered ammo. I wanted to establish a baseline for comparison. I then let the rifle cool, but did not walk down to the target, as I didn't want to influence my shooting by seeing the groups clearly. I simply depended on the Leupold 3-9 scope for aiming.

I then shot four, five-shot groups with the ten-chambered rounds.

I walked down and retrieved the target and was not at all happy. I was fully prepared to see groups, strings, scattered shots. What I found was simple: no change. Now, the four groups with the pristine ammo were three great groups, and one bad one, with a called flyer. With all the shot, the average was 1.20” Without the called flyer, the groups averaged .950”.

The ten-times chambered ammo had four really good groups, with an average of….0.950”.

Shooting a sub-MOA rifle and ammo combo, I could not see any difference in the accuracy between pristine ammo and rounds chambered ten times.

The velocity results from the chronograph told the same story. The pristine ammo produced an average velocity of 2856 fps, with a standard deviation of 37.5. If the chambering had hammered the rounds as expected, the neck tension should have some effect on the performance. Alas, what I found was this: the average velocity of twenty rounds was 2871 fps, and the standards deviation was lower than the other set, at 31.9.

What the heck is going on? Simple, the statistical difference between 2856 and 2871 fps is basically zero. You could shoot five, ten, twenty-shot groups for average, and the averages are going to wander a bit, clearly wander this much. After all, they only differ by a bit more than half a percentage point.

So, changing from my initially dogmatic and inflexible position (once in the gun and then done), I have adopted a more forgiving attitude. Basically, unless the round is chocolate-colored from environmental exposure, or the nose is mangled from repeated chambering, I’m not going to care. The mangled-nose part is more likely to happen to a soft-point hunting load than others, but that is the standard I’ve decided to go to. Now, this is not for all ammo. It applies only to factory ammo, not reloads, unless the reloads come from a trusted source. Like my reloading bench, or Black Hills.

And if I ever do this again, you can be sure I will have arranged to have a rail gun, or something similarly accurate, to use. Not that a LaRue is inaccurate, heavens no. Far from it. But the changes we're apparently now looking for are smaller than my skill level can uncover. That means stepping up the game. See you in Volume 5, then.

HEAT 'EM UP!

Yes, in the spirit of scientific inquiry, and to determine just what would happen, I deliberately heated up a Stag 3G. Smoked it, but that's what it was meant for.

We might just heat up rifles for amusement, but it is entirely possible that this soldier may need an M4 that shrugs off a lot of heat from shooting.

Our gun club is in the northern climes. Some winters we get a ton of snow, and others we get arctic cold. Occasionally, we get both. Regardless of what weather we get, winter is not as much fun as the rest of the year, as far as practical shooting is concerned. Trying to run in the snow is really tiring, and the potential for slipping and falling is great. So, we tried to come up with rifle stage for our 3-gun matches that did not require a lot of movement.

One we tried for a while was, I'll admit, a bit out there. It was called "Mad Minute" and the setup was very simple. One target at 50 yards and one target at 100 yards, at a slight angle to each other, and with twenty yards or so between them.

You had to shoot standing, unsupported. You could use a sling, but you couldn't sling up until after the timer started. You fired one shot on each target, alternating between the two targets. You had 60 seconds to shoot as many times as you could, and we would score all hits. I had a vague idea that this was going to get out of control, but not a clue as to how much. When we first ran the stage, shooters would be just thinking "is it time to reload?" when the time ran out. But we quickly figured it out, and when we did, things got ugly.

The last time we ran the match, the winning score was with 60 shots fired (I fumbled my second reload) and 59 hits, for a total of 235 points or so. We were toasting barrels at a brisk clip, and though barrels back then for ARs were relatively cheap, even we didn't see the point in using up a barrel in a winter's session of practical shooting matches.

There is a test the government has performed on M4 barrels that makes ours look like a picnic. They clamp an M4 into a fixture so they can remotely fire it. They built a blast shield around it and proceeded to fire full-magazine full-auto dumps through it on a planned schedule. They fastened thermocouples to the barrel at

various points, to track the temperature of the steel, and they shot the carbine until it failed.

To make a long, expensive and messy story short, after about 350 rounds, the barrel got so hot that even the mil-spec 4150 alloy of the barrels began to droop. That's when a bullet punches through the side of the barrel. Ouch. We never got that hot in our matches, but we certainly, even in the depths of winter, scorched the bores of the rifles we were using. (After a few times of running this match, when it came up on the schedule, competitors would show up with their most high-mileage guns, so they wouldn't roast a good bore with life left in it.)

I took the temps at various measurement points. Here, just behind the flash hider is the "muzzle" point.

The gas port is actually under the rear leg of the front sight forging, but I measured heat on the barrel between the front sight legs.

There are two enemies of steel: heat and corrosion.

Now, someone is going to say something that reveals the fact that they are new to this, “The hard chrome plating in my bore will protect it from heat and corrosion.” Alas, no. Yes, hard chrome is harder than steel and has much greater corrosion resistance. But the big weakness of chrome is that it has a different coefficient of thermal expansion than steel.

Steel has a coefficient of thermal expansion of about twice that of chrome. So, when you abuse a barrel by over-heating it, the barrel steel tries to expand faster than the chrome can. The chrome cracks. The steel also cracks, as the difference between the temperature at the interior surface of the bore and the barrel wall slightly inside creates very high stress forces.

The only way to avoid all this is to either never fire your rifle, or to fire it at such a slow rate that it can never heat up. A fat lot of fun that is, eh?

The barrel, at the mid-point, and the gas tube also at its mid-point.

The barrel, over the chamber is number 5, and the receiver over the chamber, is number six.

With that in mind, I managed to lay hands on an IR thermometer, one that does not require contact to record the temperature of an object. The best of these, the lab-quality instruments, will record the temperature, plus-or-minus a degree or so, across 1,000 to 1,500 degrees span of temperatures. The less-good ones, the ones that we can actually afford, are accurate within a few percentage points of the temperature being recorded. Let's take, as an example, a temperature of 300 degrees Fahrenheit. Hot enough to raise a blister on even momentary contact. The laboratory-grade IR thermometer will tell us that it is 300 degrees, and it will certainly be something between 299 and 301 degrees. The consumer-grade gizmo, reading 300, if it is plus or minus a percentage point, "only" guarantees that it is most likely between 297 and 303 degrees. Does it matter, really? Even a cheap, drop-it-and-it-breaks model that only guarantees three percentage points still assures us that the temperature is somewhere between 291 and 309 degrees.

So, the initial process was simple. I'd borrow a couple of rifles and do a test run or two to see what the results would be. I managed to do so at an industry gathering, and the guys there were the ever-patient Stag Arms crew. So, I took a few mad-minute runs and recorded the temperatures. What I found surprised me, so I sat down and sketched out a plan for a more thorough shooting session later on.

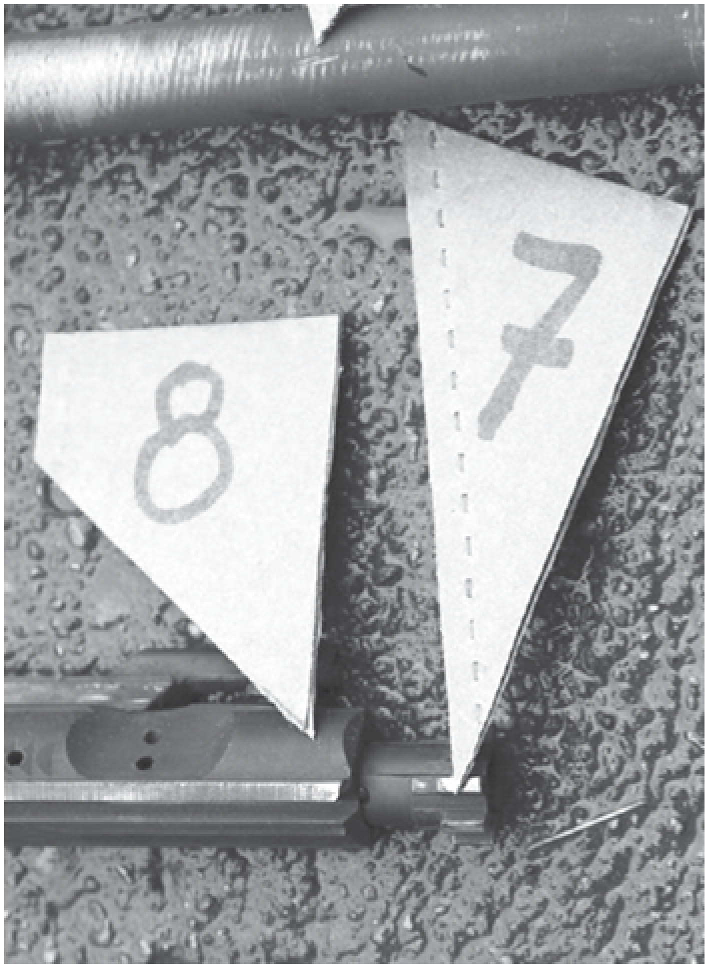
Here's the plan I came up with:

I would take a box-stock direct-gas impingement AR carbine and run it through a mad minute. To prep it for the test I would scrub the bore relatively clean and leave off the top handguard. After shooting, I'd record the temperature at a number of locations. Specifically, 1) the barrel directly behind the flash hider; 2) the barrel in-between the front sight housing loops, right near the gas port; 3) halfway between the gas port and the front of the receiver face/handguard retainer; 4) the gas tube, just at the point it begins to bend upwards; 5) as close to the retaining assembly as possible; 6) the receiver, behind the delta ring assembly and the ejection port; 7) the bolt, next to the extractor; and 8) the carrier, between the

front edge and the scoop for the ejection port door retaining assembly.

I was curious as to just how much heat would be generated along the barrel, and also how much of it would be conducted to the bolt due to the chamber heat, and the gas key and its gas flow. One of the big complaints detractors have of the DI system, along with the powder residue the gas flow deposits, is the heat the system conducts back to the bolt and carrier. I wanted to see just how much that heat was.

Now, in heating up a rifle we have several things to keep in mind. One, this is serious abuse. Second, if you heat it up too much, you can enter the land of cookoffs, where the heat of the chamber is so great it ignites the chambered round if the round is left there too long.



And finally, we measure the temperature of the bolt and the carrier right behind the bolt.

Cookoff? Yes, if the heat of the chamber is too great, the heat that the cartridge soaks up (in particular, the primer) will cause spontaneous ignition, and the round will fire. Safe on or off, it doesn't matter. If the rifle (or other firearm, for that matter) is a semi-auto or auto and there is a magazine or belt present, it will self-fire until it is empty or destroys itself. In machine guns this not so common, as the open-bolt design will usually prevent what is known as a "runaway" where even letting go of the trigger doesn't stop the cycle. In a rifle, it will mean a semi-auto firing every few seconds, as the heat sets off a round, and the next one chambers to be set off by heat as well. This is dangerous stuff.

In researching this, I looked into some tests. Specifically, the US Army, when looking at the M16E1, which became the M16A2,

tested cookoff temperatures. They went about this in a spectacularly efficient manner: they heated up rifles in a test fixture by firing them until they achieved a temperature that would cause cookoffs. Short answer: just under 900 degrees Fahrenheit will cause cookoffs. To do that, you basically have to shoot all the ammo on your person, a basic load, in full-magazine dumps, and then leave a round chambered.

What kinds of firing rates does the Army feel are appropriate, normal or necessary for small arms? Specifically, the M16/M4? The current Field Manual lists the Maximum Effective Rate of Fire, semiautomatic, as 45-65 rounds per minute. That is for the M16A12, and, curiously, they show the later versions as having a lesser rate; all follow-on models of the rifle are listed at only a 45 rounds per minute. Definitions matter. That MERF is the rate the Army feels you can effectively fire in semi-auto mode and do good work. You can't do that for very long. Continued fire, what the army refers to as "sustained" fire, is the rate you can fire for as long as you have ammo and not cause the rifle to have problems. For the Army, sustained fire is 12-15 rounds per minute.

So clearly, we're going to exceed the sustained fire rate by a factor of four.

Next time, I bring an assistant. Shooting the rifle, then juggling IR measuring tool, pen, pad, and hot rifle, can get to be a bit of work.

I can see some confusion in the crowd, so let's address this. Sustained fire? What the heck, we're dealing with human-wave attacks on a Korean ridgeline? No, well, maybe sometime in the future, but there are other uses. During the Mogadishu raid (the movie "Blackhawk Down" covers it) the Rangers had to hole up for a while in solid structures. To keep the attackers too occupied to mount an assault, one of the Delta operators scoops up an M16A2 from a wounded soldier (being treated in the first aid station) and the man's magazines. He then proceeds to a solid doorway and settles in. He fires a round into each window and doorway down the block, in turn. He isn't trying to hit anyone in particular (although if an armed man appears he's more than happy to award him a bullet for his efforts), but rather to make that block too obviously hazardous for anyone to try and lean out of a window or doorway. He is using sustained fire to keep the block controlled, at least until he runs out of the borrowed ammo.

If, firing at the Army sustained fire rate, he goes through six magazines, that comes to twelve minutes of area denial. And, if the rate is slower, to see that at least a few would-be aggressors get a hit

or a very close miss for their efforts, it could be as much as twenty minutes. That's a long time for one man to be keeping a city block under control.

And that is a lot of what the Army needs a rifle for. Not for the one-shot-one-kill sniper-like shooting that we might think of. But in a controlled volume of fire, intended to make the enemy uncertain about where is safe, and unsure as to just how enthusiastic they might want to be in leaning out and taking a shot at the Americans.

Let's take a different example; a meeting engagement. Here, two military units walk into each other while out on patrol/scouting/heading for an ambush site. At first contact, they each try to gain the upper hand. Some soldiers will start pouring fire on the enemy position (such as it is) while others will attempt to flank. If you're one of those firing, you'll be taking aimed, quick shots at likely firing positions of the enemy. If you wait to see where they are, they might (and will certainly try to) suppress your fire and prevent your flankers from working around their sides. So you can't wait to see exactly where they are, you award a bullet for each likely place they might be and move on, covering your sector. Once you get to the limit, swing back and start over, or sweep back from where you are.

Now, if you're thinking, "Hey, I'll really make them keep their heads down, I'll dump full-mag auto fire into the treeline," you'll have a rude awakening in the near future. One of three things will happen: 1. The Sergeant will come by, smack you on the back of the head and tell you to knock it off. 2. The enemy, thinking they are dealing with a machine gun, will concentrate their fire on you, thus ending your short and inefficient military career. Or 3. You'll run out of ammo before the job is done, and no one will give you any more. You wasted yours before the Sergeant could admonish you, why should your squadmates give you any of theirs to waste, too?

My test here is more like a ridgeline in Korea, with the land aswarm with Chicoms, seen in the moonlight or by parachute flares.

Sustained firing rates are not new to me. When Second Chance was a going match, I was a serious competitor on the Light Rifle Pop and Flop, or LRPF, as it was known. The event was simple, fifteen falling steel plates shaped like bowling pins, from 45 to 90 yards, that you had to mow down with your rifle. Then, put the rifle down, race a few steps and use a handgun to knock over the stop plate. Fastest time wins. In the early years you were limited to “only” (it changed from year-to-year) 15-20 runs. With equipment and timing system updates it became possible to run as many people, as many times as they wished. The last ten years or so, it was “shoot till you’re done” and you could enter as many times as your ammo, wallet or barrel could stand.

My ammo load for ARs driving to the match was two full drums, plus. I used the empty eight-pound fiber powder containers as my transport, and two of those held nearly 3,000 rounds total. I’d also add a carton of extra ammo, some years traveling to SC with nearly 4,000 rounds of .223, and rarely coming back with any. Rifles would get so hot it was not comfortable to handle them, even with the standard plastic handguards we all used back then.

I ended up, as many did, bringing a battery of ARs, set up as much identically as possible. While one was cooling, I’d be using the next. When a rifle became too hot to use, I’d pull out the bolt and carrier, run a wet patch down the bore, and leave it open to cool. By rotating through two or three rifles, you could extend the useful life of a barrel and keep them cool enough to handle and shoot effectively.

Today

While Second Chance is no more, and the mad minute match is something we don’t do, you can still heat up barrels. One match where that can happen is the Mike Gibson Ironman match. Mike makes excellent steel targets, and if there is a target system that gobbles ammo, it is instant-feedback steel. The match calls for you to arrive bearing some 900+ rounds of ammo, and that is if you

don't miss. Since your time is your score (misses have to be made up, and that means more shooting), you can end a stage with a blistering-hot rifle. But just how hot?

Trial Runs

I took advantage of the kindness of the guys at Stag to do a test run, and see if I could reliably record temperatures. I took the temperature of various points along the barrel cold, then ran two magazines through in sixty seconds and recorded the temperatures again.

I did this with three different models of Stag rifles. The shooting was boring, if easy. The hard part was juggling IR thermometer, pen and pad and hot rifle, record temps and not burn myself. Once I knew it could be done, I settled in at my home range for a test-fire session.

Stag 3-Gun model (one minute, 60 rounds)					
	Carrier	Bolt	Muzzle		
Start	77	77	83		
Finish	104	99	210		

Stag M8 piston (one minute, 60 rounds)					
	Carrier	Bolt	Gas port	Muzzle	
Start	83	83	118	124	
Finish	85	86	230	320	

Stag 3-Gun model (one minute, 60 rounds) handguard temperatures					
	Chamber	¼	½	¾	Muzzle
Start	84	86	93	93	98
Finish	98	138	150	155	165

Stag M3 16" carbine (one minute, 60 rounds)					
	Carrier	Bolt	Receiver Ring	Gas Block	Muzzle
Start	82	82	85	97	98
Finish	120	115	121	285	285

Clearly it was possible, with just a short period of intense shooting, to get the barrel up to instant-blister temperatures. And, handguards could be made hot enough to be uncomfortable in short order. This, of course, is well-known, as recounted by the Second Chance experience.

Test One

The test rifle is one I have had for years, and it has proven utterly reliable. It is a frankengun, built up from parts, but the main parts are the upper and lower made by Bushmaster back in the late 1980s. The barrel is a Colt 16” pencil-profile carbine barrel, chrome-plated bore and 1/12 twist. The flash hider is an early Vortex, and the stock is a Choate tele-stock. While it only has a standard buffer weight (I haven’t gotten around to replacing it with a heavier one, and I might not do that anyway) it does have a D-Fender extractor booster.

I took off the top handguard, leaving the lower guard in place (I had to have some place to hold on while I fired it). I realize that the missing handguard on top increases the cooling rate, but that is a minor change, and short of attaching thermocouples to the various parts, there is no way I can check the temperatures with the upper handguard in place. So keep in mind that a similar carbine, with both handguards in place, would have a bit hotter barrel under the handguards than this one.

Oh, and in case you hadn’t thought about it, the heat shields inside your handguard? They keep your hand cooler by keeping your barrel hotter. Heat from the barrel, radiating off, is reflected back, and trapped inside the handguard. Your hand stays comfy by cooking your barrel. That’s life.

I started with eight 30-round magazines, and I figured I would simply shoot the ammo as I could and quit when the temperatures got too high for continued safety. My firing rate was simple, 60 rounds a minute. My initial plan was to shoot all the ammo. But after six magazines at 60 rounds per minute, with time to measure

and record temperatures, I was reading temperatures in the mid-400s. I chickened out, as I really didn't want to see what would happen if I took the thing up to the high 500s or low 600s. I wasn't afraid of cookoffs, I still would have been too low for that, but seeing the color of steel change on a barrel as I'm shooting it is just a little bit creepy.

What I found was very interesting. The chart gives the detailed numbers, but basically the muzzle and gas port areas get a whole lot hotter, faster, than other areas of the rifle. Now, part of this is simply due to those areas being thinner steel than say, the chamber. The chamber receives a great deal of heat, but the thicker steel and the aluminum nearby soak up more of it, and the result is a lower temperature for the same shooting.

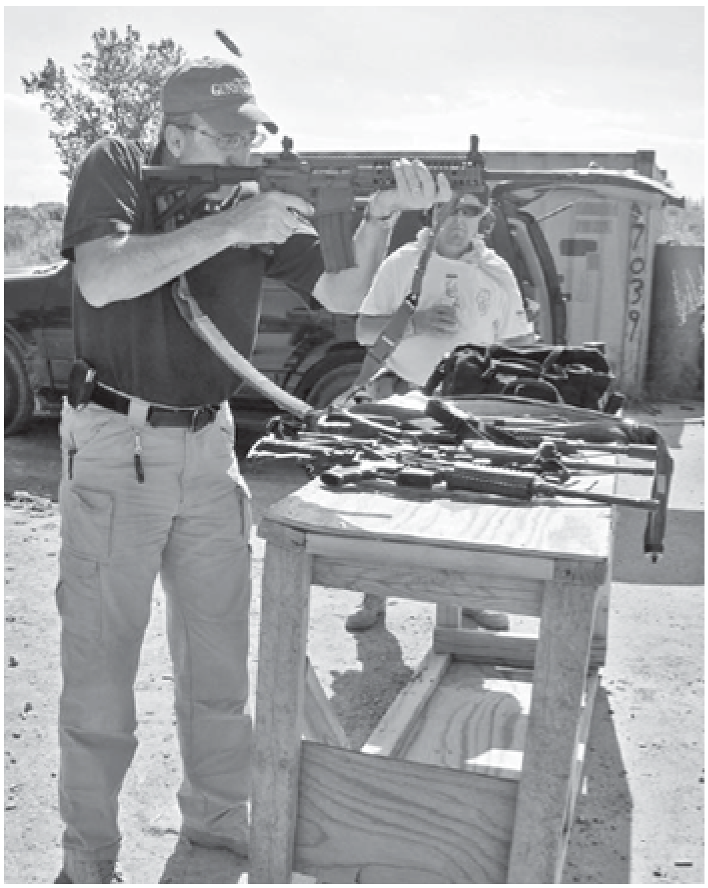
Second, the gas tube really takes it on the neck. The same hot gases that are pouring through the barrel at the gas port are streaming up the tube, which has a fraction of the mass of the barrel. What saves it is that the ratio of surface area to mass is markedly in favor of the gas tube. The gas tube, being small, heats up quickly, but with a much better surface to mass ratio than the barrel, it cools quickly, too.

I declined the opportunity to fire another segment. The gas tube temp of 465 degrees Fahrenheit as the next starting point, and the prospect of another 60 rounds, did not appeal to me.

What surprised me were the temperatures of the bolt and carrier. If we're to believe the "pistons are king" crowd, the bolt and carrier should have been blisteringly hot at the seven minute point, but they were relatively cool. Oh, I would not want to hang on to a steel part at 120 degrees, but they certainly weren't nearly as hot as the barrel.

Heat test with Bushmaster pencil-barrel clone

	Each firing segment was 60 rounds in 60 seconds. The times listed are elapsed, and the end of each firing segment.							
	Starting Temperatures							
Time	8	7	6	5	4	3	2	1
Zero	67	63	68	68	68	68	64	63
+1:00	90	98	112	175	363	310	165	205
+4:00	115	118	145	185	460	310	395	385
+7:00	120	125	160	250	465	410	415	405



Okay, the rifle has been lying in the June sun for an hour. Now, pick it up and shoot a qual course or do a set of drills. Will it be too hot to touch? Some parts will, that's for sure.

The times of the shots fired are the starting times for a minute of shooting, without an assistant it was tough to read and record the temps quickly, so I actually had a couple of minutes or more between runs to let things cool off. Which got me to thinking…..

Test Two

Having seen how hot the rifle could get, I took a more leisurely test. I heated it up and then tracked how long it took to cool. The process was simple: the same six-magazine test, with pauses to replicate the measurement of temps on the way up as I had the first time, and then set a timer. Every five minutes I'd take the temperature at each of the locations. And I was expecting to see some temps actually go up for a bit after the cessation of shooting. Temps go up? Yes. If you are measuring temperature at the surface (what else can an IR laser temperature-measuring gizmo do?), then the hotter bore will transmit heat out to the surface over time. For a short while, the temperature will actually rise, before general cooling takes over and the temps drop.

At least, that's the theory. Within the experimental measuring range, the temps took a steady drop, until by the 25:00 cooling point, they were no longer instant-blister hot.

What can we learn from this? Simple: heat is bad, so unless you really want to shorten your barrel's life, or you have a real need at the moment, ease up on the trigger. Yes, making your barrel insanely hot is good for a chuckle, as is watching your shooting buddies reaction to paint blistering off the shooting bench when you put it down, but that entertainment costs you. 180 rounds of ammo to heat something up is expensive. And spending 1,000 rounds of your barrels service life in 180 rounds fired is not really clever. So, learn from me and don't do this stuff.

Time	Starting Temperatures							
	8	7	6	5	4	3	2	1
Zero	49	51	47	48	48	48	44	44
+7:00	125	130	175	280	490	450	430	430
Waiting/Cooling Time								
5:00	120	120	155	235	410	440	410	395
10:00	115	115	140	185	345	340	340	340
15:00	110	110	130	155	250	250	250	245
20:00	100	100	110	120	150	220	215	200
25:00	95	95	95	100	120	165	160	165

SERIAL FIREARM ABUSE

Let's be clear about something right from the start: what I'm doing, you should not do. It is/was hazardous, abusive, potentially very expensive, and more than just a bit crazy. I took thousands of dollars worth of fine machinery and worked very hard to see just how far I could push it before something gave up. If you think to try the same, you at the very least risk breaking some expensive or difficult-to-replace firearms part. If things go a lot more wrong, you could damage something even more difficult to repair or replace, such as a finger, hand, arm or eye. I don't know what the current generation might have as a touchstone, but for my generation it was something all our mothers said: "It's all fun and

games until someone puts an eye out." If, even after I recount what I did and tell you to not do the same, you go and do it, don't blame me. Don't blame me for the cost, hassle, replacement parts or medical intervention. I told ya not to do it.

With that in mind, pop some popcorn, pour yourself a cold one (non-alcoholic, although you may feel the need for one before we're done) and watch in horror as events unfold.

In the beginning, the M16 was viewed as perfect. When the "Whiz Kids" under Defense Secretary McNamara decided that the M16 was "the rifle" the Army needed in its jungle fighting, they had well and thoroughly had it with the Army Ordnance acquisition system. It had taken more than a decade and millions of dollars (back when a million was a whole lotta money) and produced the M14. The resulting rifle wasn't suited for anything but doing exactly what the Garand had done, but a bit better. And, the compromises that had been made to get the M14 accepted (like the solemn assertion that it could be produced mostly on M1 Garand tooling, saving a lot of set-up costs, an assertion proved untrue) had delayed it even more.

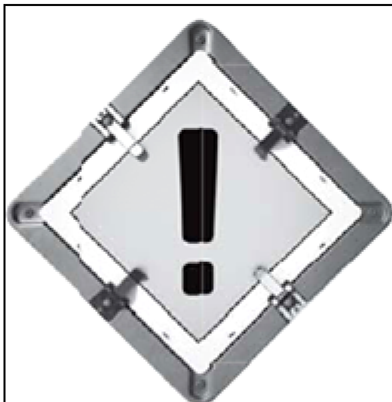
The demonstration rifle that Armalite had taken twice around the world had not failed once in the demos it had been to. And the Whiz Kids viewed Ordnance attempts to "test" and "improve" it as simply stalling tactics. Stalling to revive, or re-energize the M14 program.

So the M14 was cancelled and the M16 was adopted "as-is" without additional testing. That meant it had to be de-bugged and refined in combat, and under the severe time constraints of a war. Plus, having forced the adoption of the M16 without testing, everyone involved who had a stake in the new rifle was reluctant (at the very least) to then turn around and have to authorize additional improvements, testing and upgrades.

The M16 got a bum rap. It quickly gained a reputation as a jam-a-matic, a rifle that couldn't be depended on for anything but undependability. Most of the problems were solved before 1970. The rest, pretty much, were solved in the A2 upgrade in the mid-

1980s. And the last of the problems were solved by Colt, out of their own pocket, when they R&D and produced the M4.

Despite that, the M16 and its descendants have a reputation for unreliability, fragility and failure. So much so that to this day you can find people who will claim it to be unreliable, and point to some other (most any other) rifle as superior and more reliable. Nonsense. There is no such thing as an utterly reliable rifle. They can all be made to malfunction, and I've seen or made many of them malfunction. Even the fabled AK-47 has choked on the range with me watching. The most spectacular of them was an AK-74, on the range at Gunsite.



What I'm doing, you should not do. It is/was hazardous, abusive, potentially very expensive, and more than just a bit crazy.

Don't blame me for the cost, hassle, replacement parts or medical intervention. I told ya not to do it.

I was there for a 223 class, and in the class (which was populated mostly with Marines, SEALS, Air Force NCOs and me) were a handful of Soviet AK-74s. The security police who had them were in their half-dozenth class in a row, and they were bored with M4s. They had checked some AK-74s out of the armory, along with ammo, and headed to the class. This was long before the '74 was common, so they were not cheap imports, homebuilds or other junk.

They were Combloc-made ‘74s, being fed Combloc-made issue ammo.

Besides the muzzle brake being one of the most impressive night-time flash-makers I’d ever seen, what impressed me most was the propensity of the rifle to extract empties and then secret them inside the receiver rather than tossing them overboard. So much for the AK juggernaut.

So, at any gun show, many gun shops, ranges across the country, and on internet forums galore, you will hear that the AR is no good, and anyone with any sense will either move up in caliber to something .308-ish, or transfer laterally to an AK, a reliable rifle. Well, I’m not the kind of guy who just takes people’s word for something. Oh, in a lot of instances I’ll accept what someone says, but that’s generally after they have proven themselves. But in a lot of cases, I’ll have to try it myself, testing as I go, and keeping track of what happens.

I didn’t know what the results would be when I started this. I figured I’d ease on in and see what happened, as it was happening. When I started testing, I had people make cracks about the test. “Oh, you want to see what will make an AR stop? Just pack the bore with sand. That’ll do it.” Gee, thanks. Yes, it would, but that is like telling us if you drop a car off a 100-foot cliff, it won’t run once it has stopped moving.

I wanted to sneak up on the line of malfunction. I wanted to see if I could get just close to it and then dance, tippy-toe as it were, back and forth, to see if I could define it. Well, if you’ve skipped ahead, you know I failed. I had to escalate to ever-more heinous tortures, and finally just had to jump right up to outright abuse, torture and medieval levels of “I can’t believe he just did that” to finally get some results.

At one point, halfway through the tests, I was merrily abusing a $2,000 rifle when I turned around to see one of the club members watching me in horror. (The water and sand test, if you must know.) After watching me go through a few cycles of abuse, he finally said,

“After watching this, I have to go to confession, and you should seek therapy.”

My initial test was to explore the limits of what piston-driven rifles could withstand. I fancied myself the “destroyer of ARs, the ender of usefulness.” Little did I know I was to fail almost to the end.

That said, it was fun, even if more than a few times I cringed as I was pressing the trigger, wondering if I was going to break something expensive, or more importantly, break something on me. I did finally break rifles, but not me, which is good. So, here you go.

I asked a few AR makers for loaner rifles, and I was up-front about what I was going to do to their products. They were more than willing to send a rifle, and even commented, “Might make an interesting display rifle, if it survives.”

Stag sent me one of their M8 piston-driven carbines, in utterly normal and original factory trim, with normal M4 handguards. I expected the handguards to create problems, but found out that the handguards would actually help the rifle.

PWS sent a rifle with a purpose-built piston upper and the PWS railed handguard, exactly as they build and ship them. I also used a very early version of the PWS conversion, built on an existing carbine of mine, with Daniel Defense Omega handguard. I slapped the new PWS upper onto a spare lower I had on hand.

I had an Ares GXR-35 conversion installed on a custom-built Rock River carbine on hand, so I figured I’d give it a try. The Ares conversion is so compact you can hardly believe it will get the job done, but it does.

CMMG sent me a factory-built M4gery, utterly box-stock, and again with M4 handguards. The handguards worked well to protect the piston area from the dirt to follow.

In the rack, I had an Adams Arms conversion built on a carbine with Vltor handguard, so that got added to the pile of guns to be heinously abused.

And to address a personal pet peeve of mine, it is all too common in government work to “test” a new weapons system but not to include the old one in the testing. In any good engineering school such a “test” will get you flunked from any course in the catalog. So, I hauled a Colt 6940 along as a direct-impingement gas system sample, to make sure I was learning what I thought I was learning. Colt sent it to me for an article, I asked them if I could, and they had no problems with my burying it for the test. People love to hate Colt (and I’ve given them my share of abuse), but they had no qualms about their rifle being able to stand up to the testing to come.

The first thing to do was test-fire them all to make sure they were functioning properly. I put 180 rounds through each, using a pair each of CMMG, Magpul and Brownells magazines, to determine that they were all up to snuff. For the function check and all the testing to follow, I used two batches of ammo: Black Hills 55 grain fmj and Hornady 55 grain TAP. I didn’t select them for any other reason than that I had enough of each on hand to finish the planned test schedule. Once they were function-tested, I lubed each rifle with Master lube, according to my own specs (a bit heavier application of lube than mil-spec standards), to ready them for the first test.

I had a few optics on hand, so I added them to some of the rifles, just to see if there were problems with them getting dirty. No, there weren’t. Oh, an Aimpoint, Acog or other sight, packed with dirt, isn’t much of an aiming aid. But it doesn’t stop working. Clean it off and you’re good to go. Some rifles arrived without sights. Since I was simply blasting into the backstop, fifteen yards away, I didn’t bother installing sights.

First round

I had this idea: I’d toss ARs on the ground, even shovel dirt on them, and see if I could make them malfunction. Now, I had an idea that it wouldn’t be easy. One of my rifles (not in this test) is one I have schlepped to the LEO patrol rifle classes as a loaner. It hit to

the sights, it shot smaller groups than anyone I loaned it to, and I never lubed it. I never cleaned it. Each officer I loaned it to was told the same thing: “Don’t change the sights. Don’t put any oil in it. And if it malfunctions, show me.” After three seasons of classes it had not malfunctioned, there was green moss growing from places where the various rainy days had corroded the copper residues, and I had proven my point. Not that the proper amount of lube on an AR was “none,” but that they were a lot more reliable than people were willing to give them credit for.

My initial idea was to test the limits of the various AR piston systems that are extant, so the first test was loaded heavy with piston-driven ARs. However, in any test you have to have an established system. Called a “control” in many tests, this is the existing system (car, rifle, computer, software), and the results of the ones being tested are compared to the existing one. If they do not at least measure up to the one that is the control, well, they really aren’t much of an improvement, are they?

So, I included a direct-gas system rifle in the first test program, as a control, and others in the later ones. As this progressed, I found I didn’t need the control, for the simple fact that the AR was a whole lot more reliable than expected, and by adding rifles I was just adding time, ammo costs and work to my test.

Basic test procedure

I didn’t have an unlimited budget for ammo, so my test plan was simple: In each test series I’d load up three, 30-round magazines. I’d then subject each rifle to the test, fire five rounds and abuse again. I’d go through the three magazines, and if it malf’d, call it good. If not, move on.

Each rifle was given a break-in/test period just to make sure it was functioning properly before we started. It would really be bad form to “test” a rifle and report on dirt-induced malfunctions without determining beforehand that it actually worked properly. I didn’t try to determine accuracy before, during or after. That is

beyond the purview of a test series such as this. And, statistically invalid with samples of one.

I also entered the testing with the idea of tracking malfunctions and charting just how many of what kinds happened, in each leg of the testing. I could, if I was diligent in taking notes, get an idea of just how much each could take, and construct some sort of idea (and chart) to show how much each could take and learn when you'd have to perform maintenance to keep your rifle running.

I think you can quickly grasp, from the lack of said chart, just how things went, or rather, didn't go.

The start. I assemble a few rifles, and see if shoveling dirt on them will make them cry uncle.

Series One

The Adams conversion, in the Vltor handguard, and dirt falling off of it as I lift it up to shoot.

TEST ONE

I took each rifle, loaded it, chambered a round, closed the ejection port door, dropped it on the ground and shoveled topsoil over it. I then picked it up, fired five rounds, left the ejection port door open, put it on Safe, dropped, shoveled and repeated. In shoveling, I made certain to get a full shovel of dirt right onto the open ejection port (bolt closed on a loaded round) and to put two shovelfuls onto the forearm, to work their way down to the piston system, if any. Just to be thorough, I shoveled dirt onto the handguards of the DI-driven rifles, but I also did so with the full realization that it was pointless with them.

When empty, I changed magazines, left the ejection port door open and continued. Once I had gone through all three magazines I moved on to the next rifle. This proved spectacularly unimpressive, so I moved on to Test Two.

A faceguard to start, and dirt flying off.

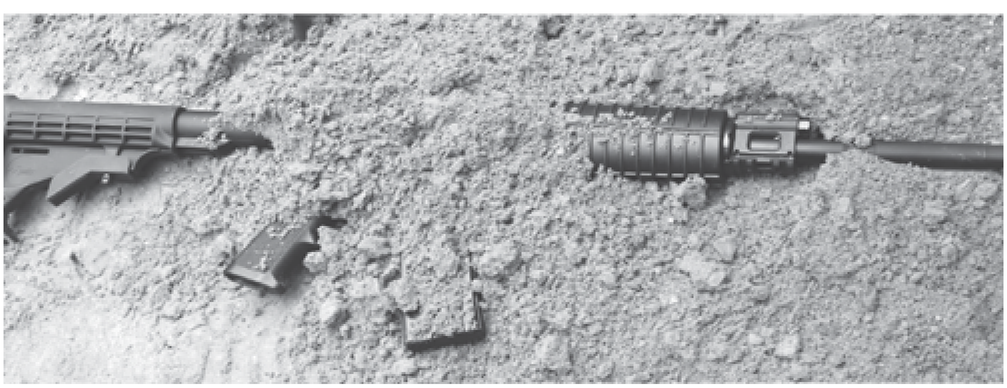
Clearly, a few shovelfuls of dirt is not enough to make an AR quit.

The Colt, brand-new, getting introduced to its future here at Gun Abuse Central.

The PWS conversion, with EOTech and AN/PEQ-2/A, getting its dirt bath. Might as well test some other gear, along with rifles.

And on goes the sand....

The PWS rifle, and a Meprolight optic, diving into the sand.



The CMMG, getting its sand hazing.

A brand-new CMMG piston-driven rifle, in the sand. You'll be seeing a lot of this rifle.

TEST TWO

Here, I didn't bother closing the ejection port door at all, and I changed from topsoil to range sand. Our gun club has sandy floors. Actually, pretty silty floors, as they are at the bottom of big pits. The sand and clay silt washes down, and we shovel, grade and sculpt to keep the ranges in good condition. But, most (some actually have grass growing in them!) have sandy floors, kind of like a beach with a good dollop of empty brass in each shovelful.

The "brass" is corroded steel, oxidized brass (mostly .22LR, as the rest get scavenged up regularly) with a few centerfire cases in each shovelful. By this time I was pretty bored with things and I was not taking a whole lot of care in placing each one on the ground. By the time I was done with this test, when I fired each five rounds, I'd push the selector to Safe and just let go of the rifle. It would fall however it fell, and I got pretty adept at using the toe of a boot, or

even the shovel, to flip it over if it happened to come to rest ejection port down.

My hope was that the sand would be a lot more abusive to the systems than the topsoil had been. My hopes proved to be unwarranted, as they all shrugged off the sand just as they had the topsoil. Oh, there were differences. For one, sand, propelled by the muzzle blast, is a lot harder and sharper than topsoil. I got to the point where I could tell you, just from the impact on my hands and arms, if a rifle had been dosed with topsoil or had been given a sand bath. And any rifle with a muzzle brake on it was a lot worse than just an A2 flash hider.

Also, the sand in the piston systems, I think, was pumping granules into the air. Not much, and it certainly wasn't hindering the piston function, but I could feel sand on my hands coming from a direction not of the muzzle.

A brief aside here, on muzzle control and testing. Even though I was dropping rifles on the ground, I was careful to not let the muzzle get packed with dirt or sand. Well, careful at first. After a few "Oh what the heck, let's see what happens" moments, I didn't bother trying to keep dirt or sand out of the flash hider. What led me to that was a few episodes of dirt in the muzzle. In the process of carefully poking it out with a stick, I discovered that the dirt was only in the flash hider itself, and not down the bore. So, the next time the flash hider got dirt in it was when I said, "What the heck, let's see….," and pulled the trigger. Result? Puff of dirt, bullet hits backstop, no apparent damage. So, while I didn't go out of my way to be careful nor to deliberately pack dirt in the end, I didn't worry about clumps of dirt or sand that I could see in the flash hider.

Taking a breather, the rifles rest in the rack before going on to the gooped-with-oil test.

TEST THREE

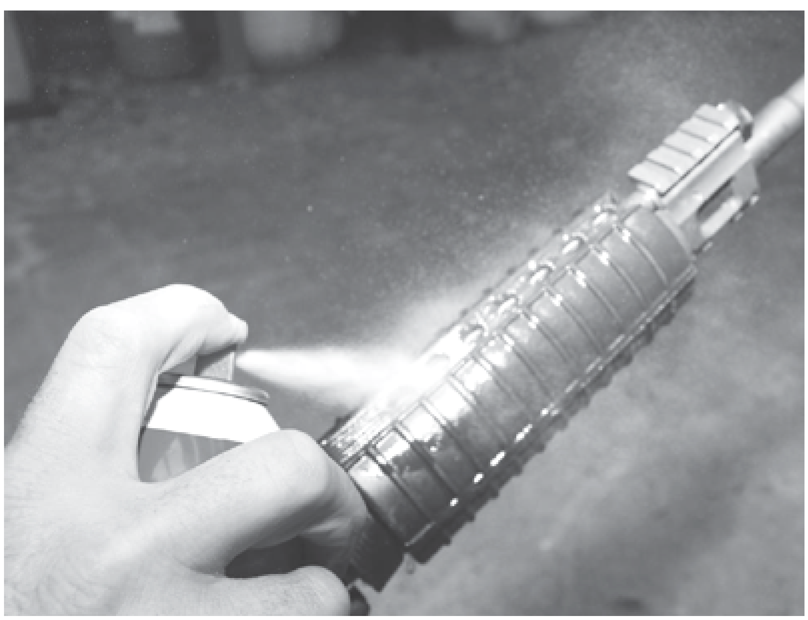
The sand hadn't gotten me anywhere, so I decided to pile on. Since most of the rifles were piston-driven, I figured I'd really create problems: I degreased the piston system. That way, they'd be running bare, dry metal on metal, and the sand could do more.

I used carb and choke cleaner to thoroughly degrease all the piston parts. Environmentally safe, kind, gentle, cleaners that don't hurt butterflies, kittens or the ozone. (Oh, for a few cans of TriChlor.) It took a full can to get the first one properly degreased. I gave up on being environmentally responsible and stocked up on as close as I could get to the real thing. That worked a lot faster.

I didn't degrease the bolt, carrier and trigger mechanisms simply because of my earlier test. A properly set-up AR will run dry in the right conditions. But dry is not how it is meant to run. If I were to degrease it entirely, I'd have to (in the interest of proper scientific method) do three tests: dry bolt and carrier, lubed piston; dry piston and lubed bolt; and both dry. Again, there is only so much one experimenter can do, so I left that level of thoroughness to someone else.

I also did not degrease the gas tubes of the DI guns. I mean, there is thorough, and then there is descending to OCD levels of detailed exactitude.

Once degreased, they all got the sand tests all over again. How did it go? To summarize in one word: bo-ring.



Do piston systems run when de-greased? Well, there's one way to find out.

EOTech holosights shrug off this kind of abuse.

Sand? An Aimpoint sneers at sand.

The Colt, gritty with sand and still working just fine, thankyouverymuch.

TEST FOUR

Since the sand on dry piston systems had proven an utter failure (heck, everything up to this point was a failure, if the goal was to create malfunctions), I figured to go in the opposite direction: too much lube. My first attempt was ugly in the extreme. I figured I'd just pour 10W30 motor oil out of the bottle directly onto the piston system.

Oh that was awful. Bad decision. Not the thing to do. You see, there was no way to pour just through the holes in the railed handguard, oil oozed all over the handguard itself, and so I ended up with a piston-driven oily mess. Everything forward of the magazine well was a sloppy, oily mess, so much so that I didn't want to fire it. I didn't want to touch it, let alone let it splatter me with oil. So, I used three cans of carb and choke cleaner getting that one rifle cleaned, plus a few vigorous swishing sessions in the club's drainage pond (we call it the rice paddy), to get it un-obnoxioused. Once clean, I used a proper oil can, pumping oil into each piston

system through the holes of the railed handguards, and gooped them up good.

Once gooped, they received the sand treatment again. Each got the five rounds, dropped, shoveled, five rounds and repeat. Each proved to be up to the task, grinding through the ammo, sand and my patience. I wore a facemask for this and an old shirt. I realized, from the sand splatter in tests two and three, that there was a lot of stuff flying about, and I didn't want any in my eyes.

In the continuing pattern, Test Four was an utter failure, except to turn even more club members away from the range in agony, and add evidence to my lunacy.

Dunk once, they don't care.

TEST FIVE

I retired to our "wet" range, the club's Range #4, taking a plastic fifty-gallon drum along. I used a five-gallon bucket and soon had the drum filled with silty, scummy pond water. I then proceeded to wet-test each rifle.

For this test, I'd load each rifle and then dunk it, muzzle straight down, into the drum of water, right to the castle nut. I'd hold it there until the bubbles stopped (after a while, I just held it down to the count of three) then pulled it out.

Now, every training manual and any training Sergeant will tell you that if you dunk your rifle, you pull the charging handle back half the cartridge length to break the water seal and let the water drain out. What I did was pull the charging handle back enough to break open that seal, and let the water drain only for as long as it took me to cover the three steps between the drum and the firing line. Then I'd fire five rounds and repeat.

Back in the water, out, five rounds, repeat until three magazines were expended for each rifle. Man, did that get boring. And messy. I was splattered with oily, muddy, silty, scummy water such that even the dogs looked at me askance when I returned home. "Dad, where have you been?"

I ended the first round of tests grubbier, wiser and with a greater respect for the AR-15. I hadn't been able to make any of them malfunction, not once.

I had expected to see some spectacular failures. The carbine with the Adams Arms conversion has an Vltor handguard on it, and the handguard provides lots of clearance for airflow. I really expected the clearance to allow lots of dirt to get to the piston and gum things up. That it let in large amounts of topsoil and sand is true. But the Adams didn't care, it just pumped the gunk back out as fast

or faster than it had arrived. The clearance was an asset, not a hindrance.

The Ares I was very interested in, because it is the simplest and the most Spartan design. It is just a conversion plug that is pinned in place of the gas tube, and at first glance it does not appear very robust. But the handguard (I used the provided Ares handguard) is a very tight fit, and precludes a lot of dirt getting in. Despite its appearance of modest strength and vigor, it never failed to cycle the action when called on.

Both PWS systems are long-stroke piston systems, and I really expected them to have problems with the degreased test, as the exposed pistons could have lots of dirt channeled to them and potentially clinging to them. They did not have any problems at all, even when faced with the oil-soaked sand test.

Repeated runs through the drum of water just washed off the sand.

With the Stag and the CMMG I expected to see a different problem. Both systems use a guide tube, extending back from the gas block, to keep the piston aligned with the carrier. I fully expected them to either have problems with the heavy oil and dirt test, or to be very sluggish when filled with water and only given a few seconds to drain. Both companies are well-respected and known for their prudence in design and testing before bringing a new model to the public. I suspect they tried both tests and perhaps even more vicious and evil tests to "idiot proof" their designs.

You know, this is getting old, tiring and wet.

The Colt? Given the grumblings and complaints, I fully expected the DI-driven 6940 to choke on every test, at every opportunity. It did not, and I was mightily impressed.

How can this be?

Those who have followed my writings on the AR, or have been in our classes, know that a certain number of rifles will malfunction in a class. They will choke from being dry, as we have seen repeatedly. On a hot summer day, the rifles that are under-lubed (at least, those prone to malf'ing from under-lubing) will start to croak in the early afternoon, usually on the second day.

The rifles used in the test, Session One, were all lubed by me, and done properly.

Rifles malfunction in our classes from the carrier key not being properly staked, and once they work loose, loss of gas pressure leads to short-stroking and double-feeds. Since most of these rifles were piston-driven, gas loss in the carrier key is a non-issue. The DI guns, I inspected and made sure the carrier key was properly staked.

Finally, we see "popped" primers from rifles with .223 chambers (not 5.56) shooting 5.56 ammo on a hot day. The rifles were

checked by me, with my Ned Christiansen .223/5.56? gage, and all found to be 5.56 chambered.

Having eliminated all the “usual suspects” when it comes to malfunctions, it should not have come as a surprise that they all worked fine. There are some other areas that can give problems, however.

Magazines can be a big problem. To preclude that source of problems I used magazines from my own stash, magazines proven to be reliable, mostly Magpul. So no malfunctions there. Ammo can also be a problem, but here I used a mixture of ammo: Black Hills, both Blue (remanufactured) and Red (new cases) and Hornady, all new factory ammo (Hornady doesn’t do remanufactured.)

Dunk a rifle in water and let it dry, and you find out where the copper fouling is. It all turns green and oozes out.

LEFT: Yes, a tack-driving, expensive and built-like-a-Mercedes LaRue OBR556 gets cleaned and lubed before the next series of tests. Stop weeping, it survived just fine.

We have also found (using the multiple instructor "we," not the editorial or royal we) that the AR as a system is under-extractored. That is, the extractor in some rifles will not retain a firm grasp of the case on extraction, and let the empty fumble about on its own. The solution is the D-Fender, which increases extractor tension by four times. The Army didn't want to pay for the patented part, so when they finally got around to admitting the problem they simply used a rubber "O" ring of the correct size.

I did not yank the rifles apart and install a D-Fender. I left them as-is, figuring if I found a bunch of malfunctions I could derive extra info by solving the problem with a D-Fender and be a hero. That is, when I found a rifle that refused to work at some point, I could install the D-Fender and then observe how much of the problem went away. Alas, my plans were dashed when the rifles continued working. I still feel the D-Fender is not just useful but vital, and have it in all my rifles, but I didn't use it here.

BELOW: Piston and gas, basic to expensive, big names to little, they all get run through the mill. Or grinder.

Series Two

An LMT MRP getting checked out before the abuse starts. This is the last you'll see of it clean.

The test was too good to leave alone so I figured I'd add some new victims and more-abusive tests. I added some hi-zoot rifles, and the grand total came up to eight ARs into the ditches this time.

I was still looking onto the idea of showing if there was a gap between the performance of piston rifles and DI-driven rifles, so the new piston rifles were an LWRCI M6A2, an LMT Monolithic Rail Platform, a Ruger SR556c and an S&W M&P15, while I used again

the Stag Arms M8 and the CMMG M4 clone. Each of them is exactly as they were sent to me, without aftermarket handguards or other accessories.

The LWRCI was their latest design, with a one-piece carrier and all the expected piston system in a railed, free-float upper. The LMT was their Monolithic Railed Platform, a one-piece upper, with piston system instead of a DI gas tube. The M&P15 was a regular M4-style handguard rifle, with the piston system inside the handguards. The Ruger was the then-new carbine of their SR556, with a flash hider machined into the muzzle, integral to the barrel. The Stag M8 was also with plastic handguards, as was the CMMG, which you may remember from the previous pages.

As a baseline, I added two direct gas impingement rifles to the test, both expensive: a Rock River Arms Operator Elite and a LaRue OBR 556. Each of them has a tubed handguard, but since the gas tube is simply a means of directing gas and doesn't move, the handguard style doesn't matter much. Both have match barrels, and I was curious to see if their tight (relative to a USGI, mil-spec dimensions) chamber would cause problems. I was also curious as to the effects of sand, dirt and water on the muzzle brake Rock River had installed on the rifle.

This time around, having just received a supply of Tetra Lube, I slathered it on the rifles before entering the abuse zone.

Some have high-end two-stage triggers, and some have box-stock mil-spec triggers. Some came with sights, others are bare on top. I am, for your entertainment and edification, grossly abusing on the close order of twelve thousand dollars worth of primo ARs.

The LWRCI, Rock River, M&P15, Ruger and LMT got the same pre-test checkout as the previous rifles. The LaRue arrived just in time for me to take it to an LEO class, so I did. There, I put around 2,000 rounds through it (without a single malfunction) and so it received a thorough cleaning before the test. The Stag and CMMG are survivors of the earlier tests.

TEST ONE

I started with the previous tests, with a few minor changes. I didn't bother with the topsoil, it simply didn't do anything and doesn't offer much in the way of abuse. I jumped ahead and did the sand tests, subjecting the rifles to sand shoveled on them, without bothering to start with the ejection port door closed. Open, chambered round, on the ground, and shovel.

This produced the expected results, that is, none.

TEST TWO

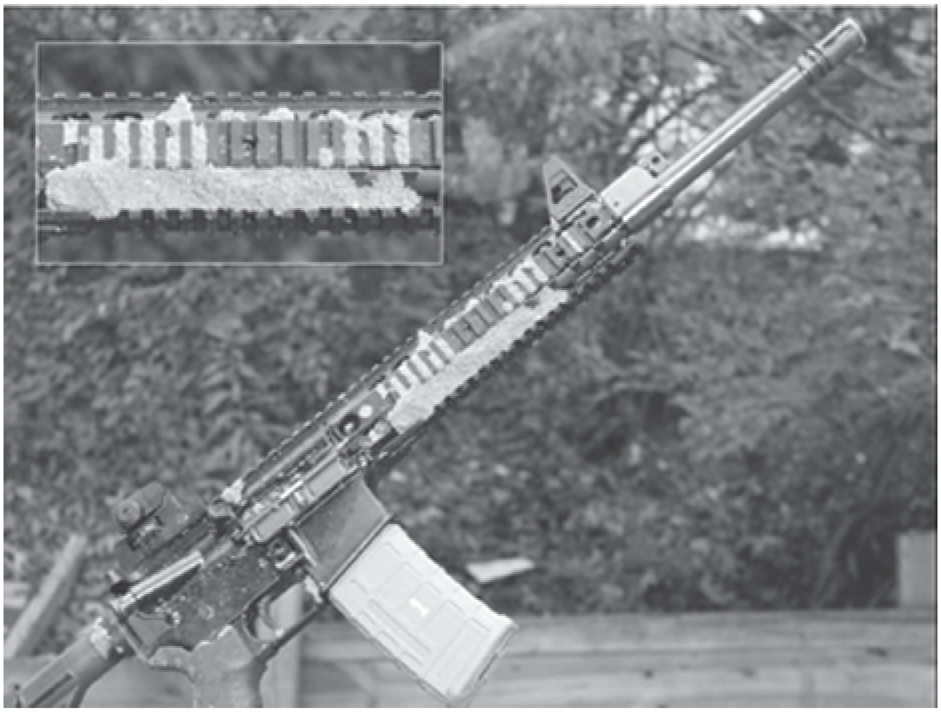
Then the degreased test, following the plan of the previous test. The previous experience allowed me to pass right over the PC-friendly "degreasers" and move right to the good stuff. Alas, that knowledge did not help, as the rifles all worked just fine here too.

TEST THREE

Finally, I over-lubed the piston systems, and subjected them to sand.

All these preliminaries led me to the same point that the previous session had: nowhere. None of the rifles chose to quit working. But I had further evil in mind. The cleaning of the oily rifle back in the first series gave me a thought: maybe adding up the abuses could do the trick.

So I repaired to the one of our ranges that usually has a standing pool of water, the club's now-famous Range #4. A recent dry spell had dried it up, so I had to fill the drum with water by schlepping gallon jugs down from the clubhouse. This had the positive effect of filling the drum with clean water, but that was not to help in the test to come.



Packed with sand, the LMT is ready for shooting.

Having shot the first set of five, it goes back into the sand for more. And more, and more….

In this test I was going to pile on all the possible variables: start with oil-gooped rifles, dunk them in water and then apply a fresh shovelful of sand before firing. So, the test process would go like this: oiled rifle, dunked in water, removed, seal broken, dropped on ground, sand shoveled on and fired. Then back into the water, out and onto the ground, more sand and firing. Here, I finally had minor success.

Some of the rifles, on the first round in the series, short-stroked. The oily piston systems, buried in sand, were bound enough by the sand/oil/water slurry in cycling to create a short-stroke. The first round or two, I had to work the charging handle to get to the next live round. But the 3rd, 4th and 5th round of that set worked fine. And, once the water had washed away even a bit of the oil, starting with rounds 6-10, the rifles worked 100%. Which rifles? It didn't matter, so I won't name names. I could take one that had malf'd on the first go-round and re-oil it, dunk it, shovel sand on it, and not have it malf this time. And the next rifle in sequence, which hadn't malf'd the first time around, did when tried again. And so on.

The Ruger getting checked out before abuse. Those who are focused on a short re-set trigger, notice that my finger is nearly touching the front

of the trigger guard.

The LaRue OBR556 blowing off sand. And steam. And I think it blew off a chipmunk, once.

Which is, actually, exactly the borderline I was looking for. I had found the edge of reliable function, without actually breaking anything.

So, if we're looking at piston-driven rifles, the 50/50 line of function is right at this point: a massively over-lubed piston system, dunked in water and then buried in sand, will short-stroke for the first couple of rounds, half the time. Anything less than that, and it won't. And the DI guns won't care how much you over-lube the gas tube.

The LaRue OBR 556 headed for a sand-nap.

There's a rifle under there. And when it comes out, it will still work just fine.

S&W sent an M&P15 for abuse. It held up just fine

An LWRCI M6A2, braced for impact.

The sand, the cursing, the non-event as it works just fine. No failures.

A Rock River Elite Operator headed into the pit. Despite being a "too delicate" DI-gas gun, it worked just fine. So much for internet experts.

Degreasing the piston and spring on the LWRC M6A2. The M6 didn't care.

The Ruger, getting the piston gooped with oil, before yet another sand bath.

Series Three

What about cold weather? If the AR-15/M16 is so fragile and unreliable, then freezing it should have an effect, right? Now, as cold as it gets where I live, it isn't as cold as it gets, if you get what I mean. Typically, I can count on at least one period of single-digit cold in my neck of the woods, with the rest of the winter-time cold levels getting down into the teens or low twenties on several occasions. Most of the time it is just below freezing, but not bitterly cold. (Hey, there's a reason to live where I live, and it isn't for the sandy beaches and tropical insects.) In really cold places, like

northern Minnesota, it can be below zero for days, even weeks at a time. Now that’s cold.

I had a new batch of rifles on hand, rifles I could thrash in the cold spell when it came. And come it did.

There’s only so much even I can ask manufacturers to pony up in the way of firearms abuse. Rather than take advantage of the goodwill of the companies I had approached before, I asked some different ones. Up for abuse in this series: one of the new Adcor piston rifles, a brand highly thought-of by fellow writers, but the first one of them I’d seen. The brand-new Rock River PDS carbine, with a piston system that allows for both a folding stock and ambidextrous, folding, charging handles. Thanos Polyzos and Kerby Smith of Para USA sent me one of their TTR. The Tactical Target Rifle isn’t a piston-driven system, it uses a modified and refined DI system, one that allows a folding stock. Alas, after I did the test, Para USA dropped out of the rifle market, but you can still get the same rifle from its originator: Al Zitta, of Z-M Weapons, where it is known as the LR-300.

On the piston conversion front, I went with a new company, at least new to me; Osprey Defense. Their piston conversion replaces the carrier in your rifle, which works with the new piston (inside new handguards) to provide piston power to your AR. I installed it on the test-mule Rock River carbine I have on hand.

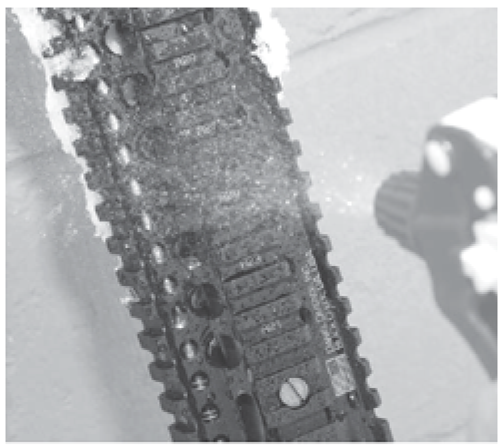
Barrett has now offered their REC7 in 5.56, and when I mentioned the upcoming test at the recent SHOT show, they were all eager to get one included. I hadn’t even had time on my return from SHOT to fully unpack when the package arrived from Tennessee.

Let them chill overnight, then spray cold water directly into the piston system. Then we stick them in a snowbank.

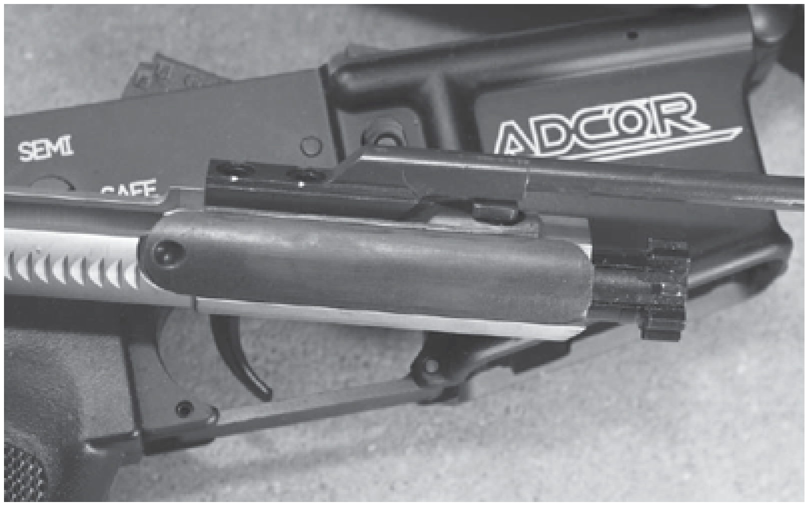
Finally, to keep a baseline in the tests, I pulled the poor, much-abused CMMG piston carbine off the rack. This carbine has been through the dirt and mud test three times, and went on the top of the truck-load for the latest test.

As the ranges were frozen solid, there was no way I was going to shovel up some range sand to toss onto the rifles. So, instead I stopped at the local hardware store and bought a couple of bags of all-purpose sand. Unlike the small, beach-like sand of the ranges, all-purpose sand is more like fine gravel. It has a sandy component, but there is also a good percentage of sharp-edged tiny rocks in it. I started the tests by shoveling this onto the rifles and doing the now-standard three magazines, five rounds at a time, with generous amounts of sand along the way. Same as the previous tests, but with temperatures in the low teens. I did this when it was merely cold out. Then, I left them gritty and uncleaned until the next cold snap. As the CMMG had already been through the drill twice and had nothing to prove in this regard, I gave it a pass. But it would not avoid the upcoming horrors.

Let’s switch to cold. Let’s freeze some rifles and cold-soak some ammo.

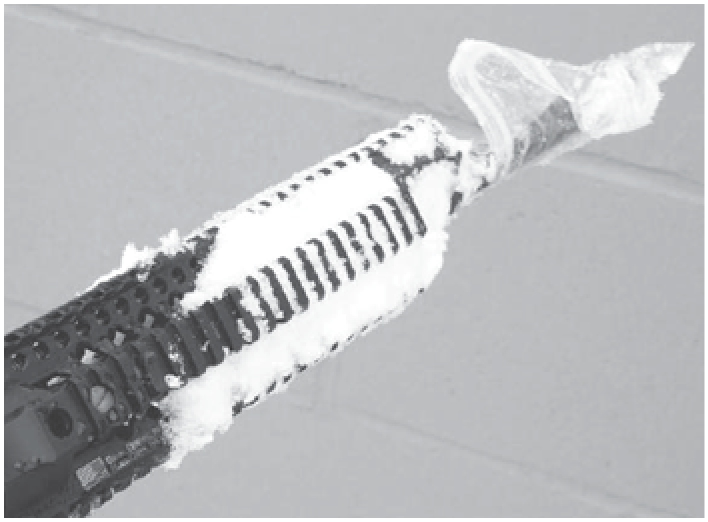


Between runs, we spray more water and stuff them back into the snow.



A new and promising entrant: Adcor. And it stood up to all this as well as the old-timers, without fail.

A Barrett going face-first into the snow.



I wasn't completely crazy, I used a plastic bag to keep snow out of the bore.

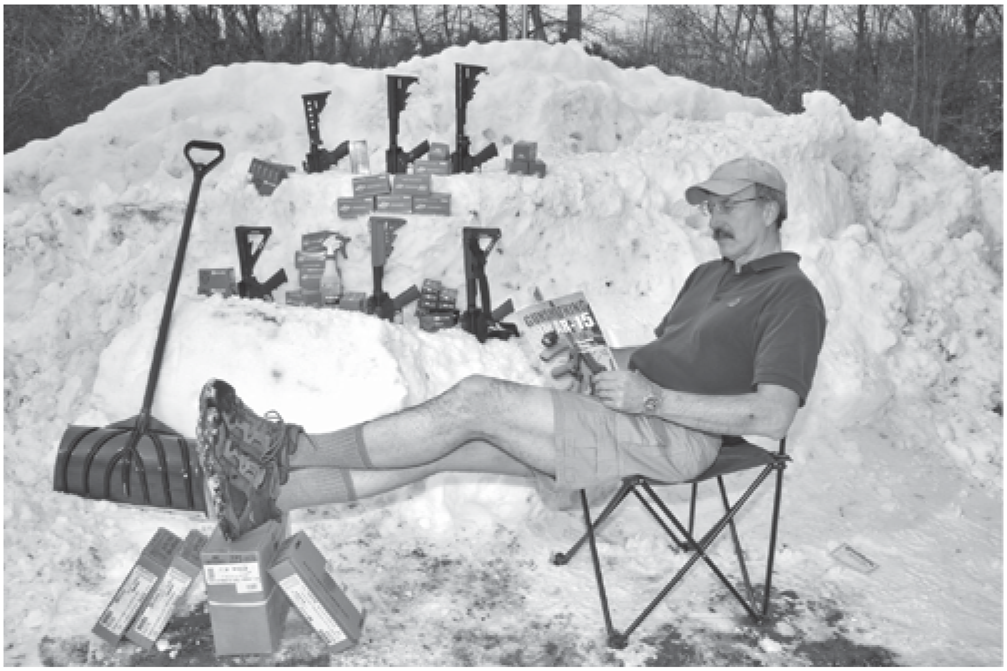
As before, I left them as-shipped. The Adcor and REC7 came without iron sights, although the Adcor had an EOTech on it, which I left in place. If they had folding sights, I didn't even bother to stand them up, unless in so doing I created a clearer path for the entry of dirt and snow.

Now, simply getting them cold and putting three, thirty-round magazines through them would be no test at all. So, I had to proceed in a different manner. I tested all the rifles at once, and rotated through them in each step.

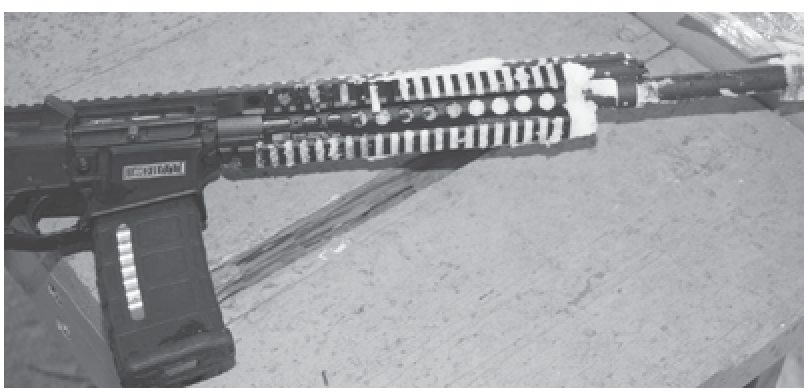
First, I had to get them wet and cold, and then chill them some more. So, I left them in the car, in an unheated garage, overnight. Then, I took them out to the gun club on a bitterly cold day. Before I hauled out the rifles and ammo, I took a spray bottle of cold tap water and slung it into the snow where it could get good and chilled.

I unceremoniously tossed the ammo and the rifles out into the cold. Once I had everything arrayed just as I needed, I loaded the rifles and then thoroughly sprayed the piston systems of the piston guns, and the bolt and carriers of all the rifles, with cold water from the spray bottle. I then wrapped a plastic sandwich bag on the muzzle (I had no interests in seeing how barrels would respond with

the bores choked with ice) and stuffed them muzzle-down into the convenient snow bank. I shoved them in to the trigger guard, and left them there while I stoked the woodburning stove. (Hey, this is a test of the rifles. I already know how *I* respond to freezing rain, bitter cold and lots of snow.)



It takes some patience to cold-soak rifles. At least I have some good reading while I wait.



The Adcor, with the piston system packed with snow and freezing water.

The poor, abused CMMG, with a snow-caked piston.

PARA AR getting its snow test. They don't make them anymore, but you should buy one if you ever get the chance.

The Rock River piston-driven handgun. I could not make it fail.

TEST ONE

Once the old clubhouse was warmed up a bit I came out, fired five rounds from each rifle, re-sprayed the piston systems and bolts and carriers, shoved them back in the snow, and went get warm again. I continued through the obligatory three, thirty-round magazines. Just to be clear, the process went like this: fire five rounds through rifle #1, re-spray the piston system with water, and stuff it back into the snow bank. Fire #2, re-spray, and so on. All of which got me precisely nowhere.

More Adcor abuse.

The snow flies, the bag blows off, and another rifle continues to work.

TEST TWO

Time to up the ante. I gave up the freezing water and simply shoveled snow on them. Snow-caked rifles produce a spray of snow when fired. Showy, but it doesn't really do anything.

TEST THREE

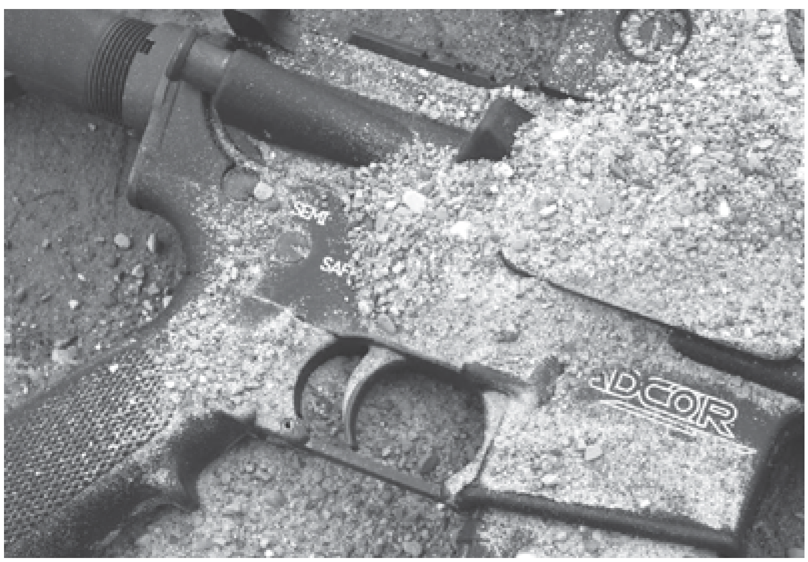
Next step? Lock the bolt back, shovel snow directly into the open ejection port/chamber area, shove in a magazine and fire. No joy.

Even crusted snow and ice get tossed when a piston drives them.

Yes, I had a towel handy to clean my glasses off after each test-firing.

They all took turns, and they all worked flawlessly.

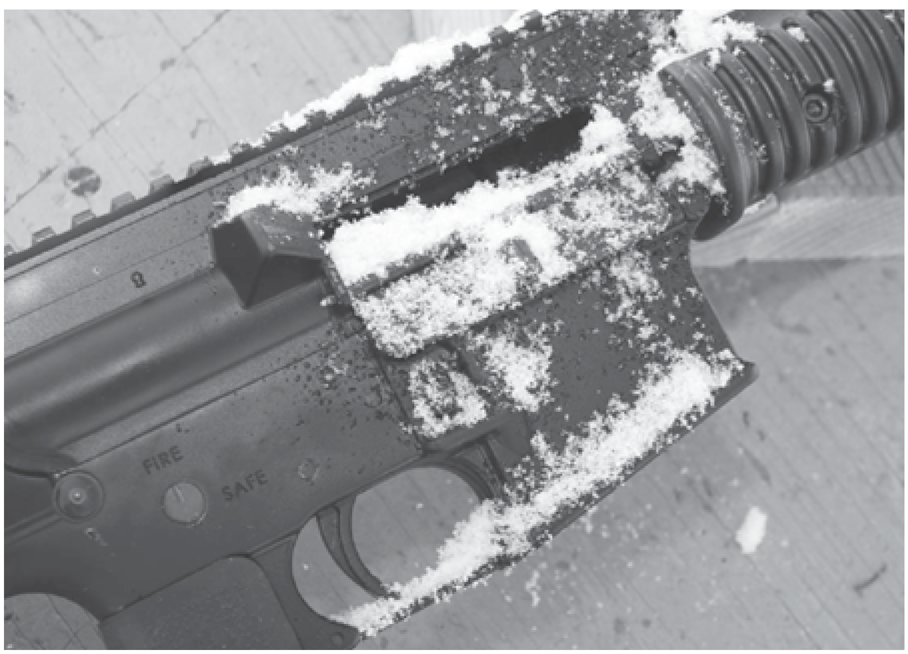
A festive way to spend the holiday season, making one's own snowfall.



BOTTOM LEFT TO RIGHT: Adcor shrugged off the all-purpose sand.

PARA and its sand bath, streaming off as I pick it up for yet another failed attempt at malf-ing a rifle.

Sand? We have sand that will make rifles fail! Not. Barrett prevails.



I finally just shoveled snow directly into the open chamber, slammed a mag in, and failed there, too.

SERIAL FIREARM ABUSE

Why test for cold and snow? Because there are cold places, they have snow, and you may fall down in it.

TEST THREE-A

Bolt locked back, shovel snow in and let it sit for a while, freezing. Then insert a downloaded magazine, one with only five rounds, left in the snow next to the rifle, chamber a round, and let it freeze some more.

I really thought this last one stood a chance of creating problems. After all, I was introducing snow directly into the receiver. I was letting it melt a bit, run into places it ought not to be, and then re-

freezing. And, I was introducing a wet cartridge into the chamber, where it could freeze, too.

Oh, and along the way I dropped the whole plastic-bag-over-the-muzzle thing. It was a real hassle, and when the bags tore, snow got into the flash hider anyway. There, it didn't do any more mischief than sand or dirt in the flash hider had done, either. So I saved myself the work.

By the time I was done with the planned tests, I was cold, frustrated and ready to go home. But, I had bought two bags of all-purpose sand and only used one so far. So I took the cold, wet rifles and shoveled the sand onto them, repeating the three-thirty-round magazine test. By this time the rifles were wringing wet and cold-soaked to the point of requiring gloves to handle. Any contact with metal was an unpleasant experience.

In all this work, planned and spontaneous, I produced exactly zero malfunctions. If I was going to get results, I'd have to bring my "A" game. This required thought. I decided that I could mull things over until it warmed up, as cold clearly wasn't going to create problems, except for me.

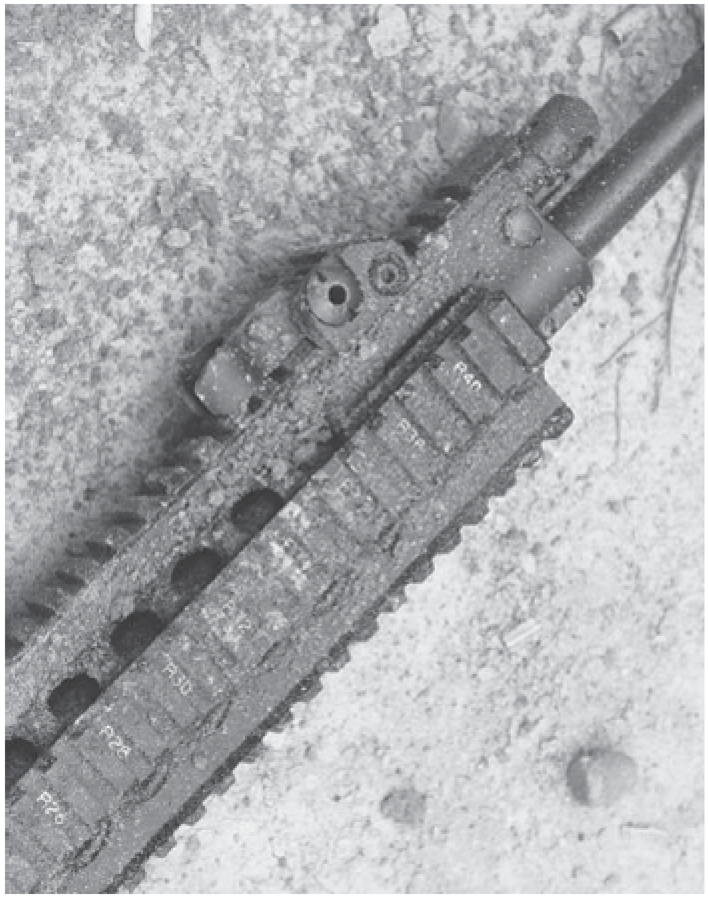
Now, this is not entirely unexpected. Previous efforts had also failed. While the Barrett REC7 has a piston open to the elements, riding underneath the DD Omega 9.0 railed handguard, it also has no place for sand, ice or snow to build up. After each iteration I could see the piston, and it is clearly self-cleaning in the exposed areas. Whatever got in there got blasted out on the first shot.

The Rock River PDS is covered such that you can't see the operating parts. While there are clearance slots for the charging handles, I could not get enough ice, snow or sand in that way to make any difference. The sand test at the end (and not in the beginning) made the charging handles gritty in operation, but didn't stop it.

The Para USA TTR is also a design that is well-covered. The top rail is tightly-fitted and removable to gain access to the gas system, and with it on no amount of snow or freezing water is going to

make a difference. With it off, you probably aren't a real clever fellow to be shooting it, so I did not test it with the cover off.

Now we up the ante. Water and sand. Filling the barrel was almost as much work as the shooting.



Water and sand should stop them, right? Not this Ruger, not any of the others.

A dunk, a dirt-nap, and a test fire. No problem, they worked. This is getting old.

The Osprey is one I have been keeping an eye on for some time, and I was glad to get a chance to try it. It comes with close-fitting handguards that protect the piston from snow and ice, and it shrugged off the sand I shoveled at it. The snow had no effect whatsoever, not being able to gain entry. Now, if you were to eschew the plastic handguards, and replaced them with a railed one, thus giving the snow and ice access, I doubt it would make a difference. When closed the piston is well-sealed from the elements and as it cycles it obviously would break the ice formed on it.

The Adcor? First, it has a panel on the carrier that fills the ejection port, so there is no door to leave open or close. That panel

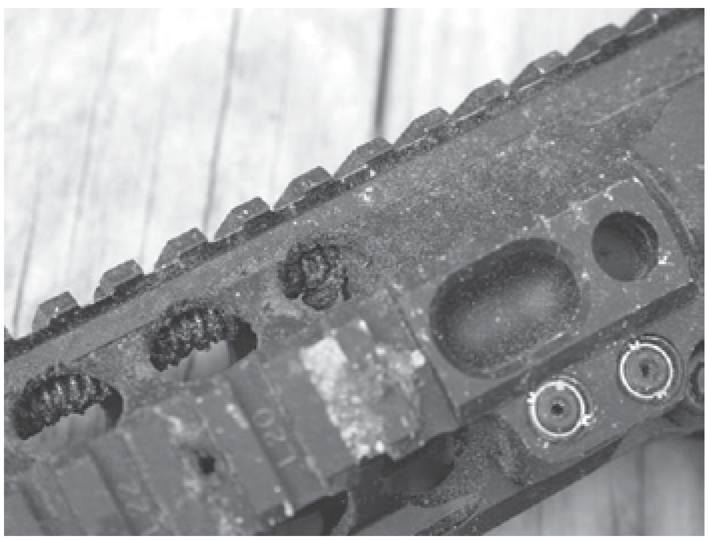
essentially seals the ejection port. Sand shoveled at it had no effect. I really expected the folding charging handle to be frozen in place or seized by the sand, but it shrugged off my efforts and chugged right along.

Now, I could clearly make a piston system cry uncle (and a DI system not) were I to simply freeze the forearm while immersed. As a solid chunk of ice, it would have to be a truly heroic piston system to function, but that would be cheating.

I've tried all the reasonable malfunction items: mud, sand, dirt, oil (or the lack of it), water, and now ice and snow. I have failed to produce any consistent malfunction that could be attributed to abuse or neglect. I have to ask again, will someone show me the miserably unreliable M16/M4 or AR-15 that everyone has been talking about for decades? Because I haven't found it.

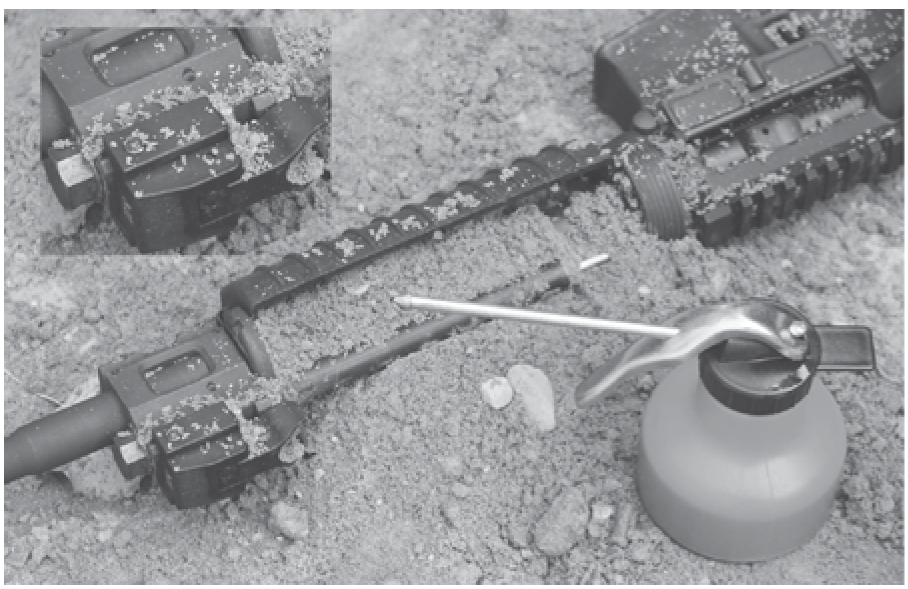
ABOVE: Once gooped, twice shoveled.

Okay, let's really up the ante. Oil, then dirt.



You can see the sand stuck to the spring, and yet, we worked. To get any malfs, we had to triple-whammy them: oil, sand and then water. And that barely worked.

Oh, what a mess. A sandy, oily, mess that still fired when asked.



I tried, I really did.

Series Four: Medieval Abuse

If I expected to get results, clearly I was going to have to increase the abuse. And I clearly couldn't do it with as many rifles as I had before. At this point, more rifles just made the whole process

unwieldy. So, I pared the crew down. I decided I'd do just four, and those four would be two heavyweights in the AR field and two little guys. The heavyweights were Lewis Machine & Tool and LWRCI. LMT sent me another one of their piston-driven monolithic upper carbines in 5.56 (I wasn't going to add any extra calibers to my headaches, so all were 5.56).

I also decided to focus solely on piston-driven rifles. I had, I thought, proven the durability of the direct-gas design, and how it was really tough (nay, nearly impossible) for me to make them choke. I had some ideas, however, that would work directly against the perceived weaknesses of the piston designs, so I went just with rod-driven and not gas-flow carbines.

LWRCI sent one of their SPR carbines with a green Cerakote finish on it. Where the other rifles were "just" anodized, I was really looking forward to seeing what the Cerakote could withstand. I've heard good things about it as a firearms finish, but not from anyone who had undertaken the tests I was about to do.

The two small guys were CMMG and PWS. So confident were they, CMMG told me not to send back the carbine I had already abused twice, just use it again for the next test. I didn't even bother to scrub it up, but I did lube it properly. Somewhere along the way, it had the M4 handguards swapped out for a set of drop-in Midwest Industries railed handguards and gotten a set of MI folding sights as well. I left them on, figuring I could learn more about abusing them than simply shredding a set of USGI plastic handguards and bare rails. It also had sprouted a vortex flash hider. I figured it would make for an interesting data point, as two others had A2 flash hiders, and the PWS had its compensator.

PWS sent one of their long-stroke piston carbines along, a Mk116, 16" carbine built on their lower, with their buffer tube and other goodies. It came with Magpul BUIS, front and rear. Oh boy, plastic sights to thrash. The flash hider on the PWS isn't, it is a low-profile muzzle brake, and I was very curious to see how well it would hold up to multiple impacts.

OBLIGATORY TEST

The previous tests had been a warm-up, but hey, by now it's a tradition. So, I subjected all the rifles to three magazines of sand abuse, except for the CMMG. It had already gone through three prior tests, so I didn't have to wonder if it was ready for the tests to come. I was glad to see that the PWS came with sights, as the other three had sights on them already. Considering the tests to come, I made sure they were all properly zeroed. Well, "proper" in that I could hit the club's 100-yard gong with them, and make whatever sticks and clods of dirt out there at 100 yards jump when I shot. The POI of them were all within a couple of inches of POA when I started.

TEST ONE

I figured, "Hey, rifles get dropped from time to time, so I should drop-test them." Now you may think that simply dropping a rifle is no big deal. Sure, it will get scratched, or grubby, but so what? Well, when the Army was testing the M16E1, which became the M16A2, they did drop tests. They broke a rifle in two. Granted, it was the 65-degrees-below-zero part of the test, and the rifle and the surface it was hitting were frozen so solid they might as well have been slabs of concrete, but they broke it. They snapped the lower receiver right where the buffer tube screws in.

Now, my home club never sees 65 degrees below zero temps. Plus, I could not wait until winter again. I also had no towers or helicopters to hover and drop rifles. So, I had to content myself with the standard, sandy, range surface and as much height as I could manage.

The first test was to climb up on top of the club's ballistic baffles and throw the rifles off. Each baffle system is simply a wooden rack up on stilts. Think of the rafters in your basement. Think of shooting at a right angle to the lengths of the rafter boards. The array of

boards (two-foot boards on two-foot centers) are enough to stop even a .30-06 in the third board. We simply stand under them and shoot into the backstop, and as long as you can't see blue sky ahead of you, you are kept from hurling a bullet off the property. Of course, in order to have enough room to move around under them, they are as tall as, or taller than, a ranch house. The small ones put my shoulders "only" fifteen feet above the range floor. The taller ones put my shoulders some twenty-five feet over the range.

So, up on top of the big baffle I climbed, to throw each rifle off. Now, I'm not a lunatic. I didn't have a round in the chamber. And while I was willing to start with a magazine in place, if I found that it was too hard on magazines, I'd leave them out of the equation. Quick answer: magazines do not like being dropped or tossed twenty-five to thirty feet onto the ground. And you know, I really wish I'd thought this one out before I gleefully described the process I'd follow to my editors and fellow shooters, but once I'd opened my big yap, I was stuck.

Tie a rope to four rifles, climb the ladder to the top of the baffle, haul the rifles up, untie them, toss them off, climb down. Once down, load, shoot five rounds, tie the rope and repeat. After a few iterations, decide the rope was a bad idea, and simply sling the rifles over a shoulder and climb up the ladder. Let me offer you some advice, if you ever take into your head to ignore my advice and try this: don't. If you do, you won't need a membership to a fitness club. This is work.

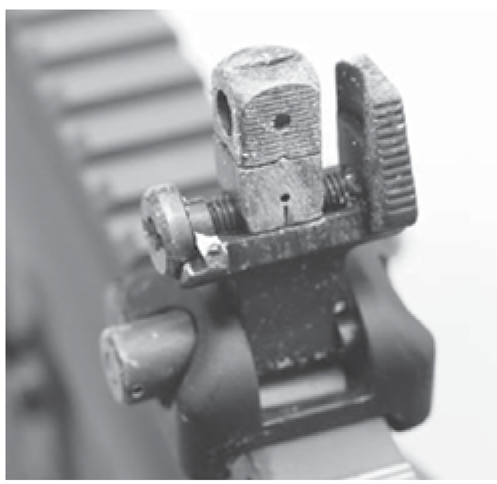
As I fired five rounds out of each one, I paid attention to the point of impact, to see if the dropping had caused any problems with the sights or the barrel. The drops did not cause problems with the barrels, other than packing sand and stuff into the flash hiders. However, the sights from drop to drop would get so packed with sand I could not see through them to shoot.

Drop? I don't bother with mere dropping. I throw them out of a second-story window (or its equal).

Drop a rifle, spear debris on the sights. The LWRC SPR wasn't fazed at all.

The flash hiders will get caked with sand. You should clean them out, as I found out later.

I cleaned the flash hiders by banging the barrel against a post.



Drop the rifles on each other and you can break things like sights. Well, part of the sight, the aperture still works

For the flash hiders packed with sand, I simply whacked them against the posts of the baffle system and dislodged the sand well enough to shoot. If I could not see through the sights, I fired into the backstop. In a military context (not so much in civilian or LE use), seeing the sights isn't always vital. If you're putting suppressive fire

into the treeline, getting shots off is sometimes more important than cleaning the mud out of your sights. And if it is, you're there with all your friends, they can do without you for the few seconds it takes to brush/scrape the sand and dirt out.

At one point I dropped rifles (I was up to tossing them two at a time by then), and when they hit I saw a piece of something fly off. Oh boy, success! Well, when I climbed down, all I found was that the rubber recoil pad on the LMT stock came off. It is a snap-fit into recesses in the stock plate, and the impact had caused it to come off. I left it off, figuring if it keeps flying off I'll lose it sooner or later. I may be abusing the rifles, but at least I'll get all the pieces back to them when I'm done.

A few falls into the test, I was running out of enthusiasm and not so careful to drop them separately. They started banging into each other, and that's where I started bending sights. I bent the sight post on the Magpul rear on the PWS carbine. I busted one of the rear sight ears off of the LWRCI SPR. They both worked, although aiming the PWS after that was more of a guesstimate than an aim. They all got dirty and scratched, and I got tired of climbing the ladder.

At no time did any of them decide they'd had enough and quit on me.

Throwing risks hurting yourself more than hurting the rifle.

Throw a rifle onto a lawn and you gouge mud out with the sights. Despite this, the LMT sight worked fine when I hosed out the dirt.

TEST TWO

Next up is a prospective new Olympic sport: rifle throwing. Off to the old club parking lot, the one that has the gravel laid down decades ago covered by topsoil. You know, when the leaves fall, and decay, and we don’t blow them away. And the grass takes hold, and before you know it, it is a grassy field? That kind of lot.

The hard part of throwing an AR is holding it, and then letting go. Aiming? Not so much of a problem, as long as your ”target” is the surface of the earth. They’ll all fall, eventually, no matter how hard you throw them. The buttstock doesn’t offer a lot of purchase, unless it is one of the new triangular ones like the various Magpul designs. The muzzle end has relatively sharp edges. And, you’re trying to throw a seven-pound object. You could hurt yourself. Still, I managed to get some impressive distance out of those puppies. The sights and other protuberances quickly became not just clogged, but packed with mud. The sights were simply mud-slathered lumps ion the receivers and barrels. Once, I managed to toss a rifle “just so” and it landed muzzle-first, impaling itself into the earth. That one, I

figured that falling and packing the flash hider with sand and dirt was one thing, but hitting the ground like an “AR Lawn Dart” was likely to get dirt up the bore. My plan was to poke a cleaning rod down the bore before I fired it. That, and my forgetfulness, lead to problems later on.

Since the parking lot was up on the hill, I didn’t bother to shoot them. My estimate was simply this: if they were going to be damaged by throwing, I’d find out right away. My thought was that the damage would be in a bent buffer tube, and by simply hand-cycling the action I could tell if they were being bent or not. Well, they all hand-cycled just as they had before the throwing.

TEST THREE

I hauled the rifles off to the club’s newer parking lot, the semi-gravel one. There, I would take each one by the barrel (first time) and wind up and throw it as far as I could. Then to the firing line, load and fire. Back to the parking lot, hold it by the buttstock, wind up and throw.

I did this through the now-standard (and again, had I thought this through from the beginning, I would not have selected ninety rounds as the basic step of each test) three magazines, and during that time I did not, again, see a significant change of impact. Well, at least, not on the sights that stayed intact. As the throws went on, sights got more and more mangled and busted. I’m sure that an NRA High Power shooter could tell me how many clicks each of them required to get back in the ten ring at 600 yards, but I wasn’t testing that precisely. Of course, before he could tell me that, he would have had to hose the mud out of the sights from the previous test. The gravel crafted a lot more gouges and scratches on the receivers and barrels and smushed over more of the sights, but the rifles still worked.

If after each iteration, I could still whack a miscreant, freedom-fighter or terrorist in the A-zone at 50-100 yards after finding the

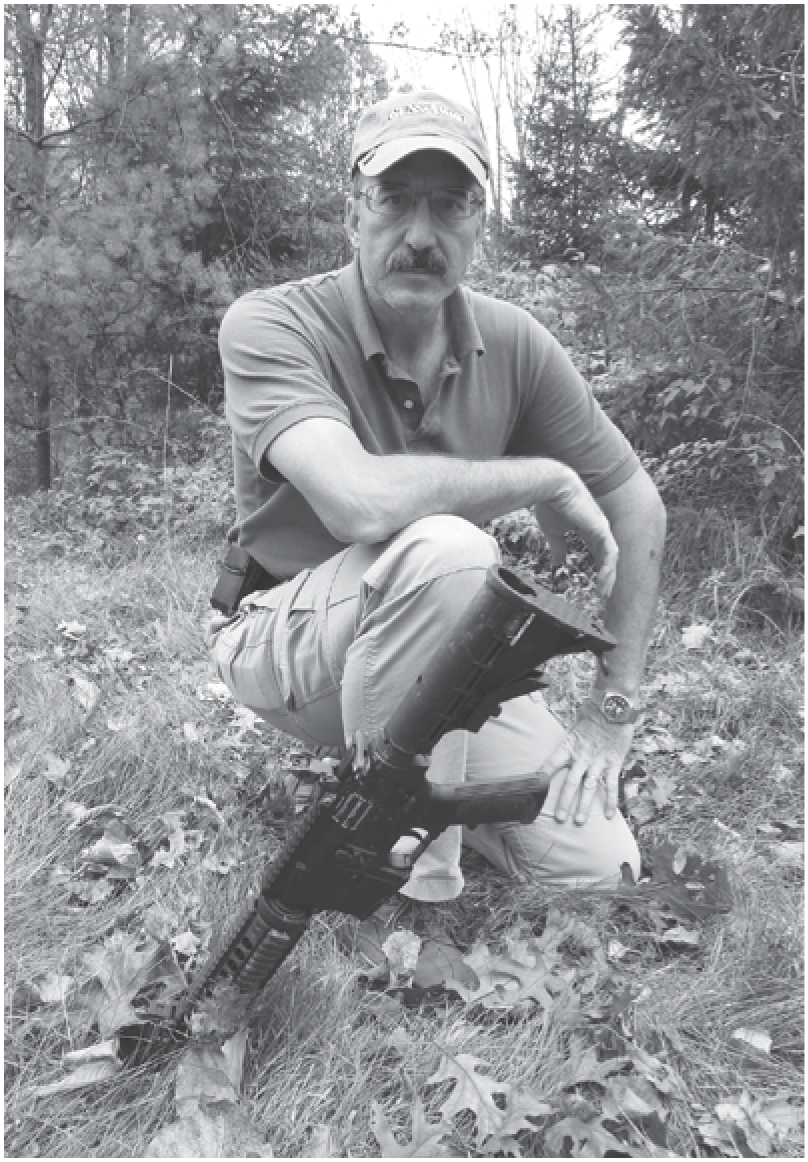
point of impact, I was happy. And I was happy shooting most of them, but I may have to re-think my affection for folding BUIS. Of the sights, the one that held up the best was the LMT, which is basically the A2 carry handle with the front portion chopped off. That thing could be used as an impact weapon, a skull-crusher, and not suffer from the experience.

Alas, in my enthusiasm for the enterprise, I forgot to poke a cleaning rod down the bore of the CMMG and its Vortex flash hider. With apologies to Smith Enterprise, Inc., I broke your part. At the first shot, two tines of the flash hider flew off, one hitting my photography assistant. (Another example of the importance of wearing glasses. Don't do this yourself.) My brother Mike, a professional engineer, was on hand, and he looked it over. "Hmm, no inclusions, a white-metal break. This is good alloy. How'd you do this, again?" I did it by mistake.

TEST FOUR

The next test was simple, I ran them over with my car. Back at the grass-covered parking lot, I laid them in a row, crossways to my direction of travel. I ran them over right at the middle of the receivers. Then I'd pick them up and hand-cycle the actions again. Next step, lengthwise, ejection port side up. And finally, ejection port side down, lengthwise.

The rifles were not impressed by a passenger vehicle.



Throw them enough and you may have this happen. I got too cocky at this point, and it lead to problems later.

Drive over rifles with a light truck and you will embed them in the soil. You'll have to pry them out, but they will still work.

Now, my car is "only" a Ford Taurus, so I invited my brother to drive over them with his Ford Ranger 4X4. The interesting thing was that the Ranger drove them into the ground such that they left an impression, just like the roadrunner, in the dirt. To get them out, we had to dig our fingers into the dirt and pry each rifle out of the grass and soil.

In prying the LMT out, I discovered that the Ergo grip pistol grip it bore was not so solid a grip. The internal stiff polymer structure of it had been broken by the driving, and while it was still attached and still worked just fine as a pistol grip, you could feel it wobble side to side inside of the softer polymer covering. I have had others handle the rifle since, and unless I point it out to them, it takes a while before anyone even notices. But we did manage to break something else. In driving from one location to another at the club, we tossed the rifles into the back of the Ranger.

TEST FIVE

Considering that perhaps the grass was too accommodating, I repeated all this driving on the new parking lot, with lots more gravel and sand in it. I found a nice patch of gravel and made sure it was uneven before dropping the rifles onto it. After a few passes with the Ranger, one of the club members arrived with his truck, a Ford F250 Super Duty V8 Diesel. Oh boy, six tons of truck. So we drove that over the rifles, too.

Blowing the dirt out of the PWS comp.

Pack a flash hider full of dirt, let it harden, then fail to clean it out and things get ugly. But the rifle still works.

The LWRC SPR continues to work. Darn.

And found a measure of success. On the range trip to test fire them, the LMT fired its first round, and then refused to fully close. Hmm. I popped open the action only to have the buffer weight and spring leap out like an annoyed cobra looking for lunch. The F250 had proven too much, and the buffer retainer and spring had come out of their hole in the receiver.

Now, this is not entirely the fault of the LMT. In looking at the photos, I realized that our pause for a photo-op had done it. Yes, we parked the idling F250 on the rifles and took turns in front of the camera. Well, it was parked on the LMT, and when the F250 first rolled over the rifles, I had commented to my brother, “You can see them bend and flex under the load.”

We had parked the F250 on top of the LMT, and the flex of the receiver had allowed the tube to pull away from the retaining plunger and that little SOB had popped loose. Had we parked on any of the others, they might have done exactly the same.

Of course, the parts refused to simply fall out when I turned the rifle upside down, so I went to pop the pins out and discovered that I had broken more on the LMT. The front takedown pin had the left

side end of it snapped off. The pin had stayed in place through the abuse, and only when I went to take it out did I notice.

So I pushed the front pin across just enough to free the upper but not let the takedown pin retaining plunger and spring fly free. I removed the hammer and trigger, shook the rifle until the parts fell out, then reassembled the fire control parts. Other than having to hold the buffer back as I closed the action, the LMT continues to work just fine.

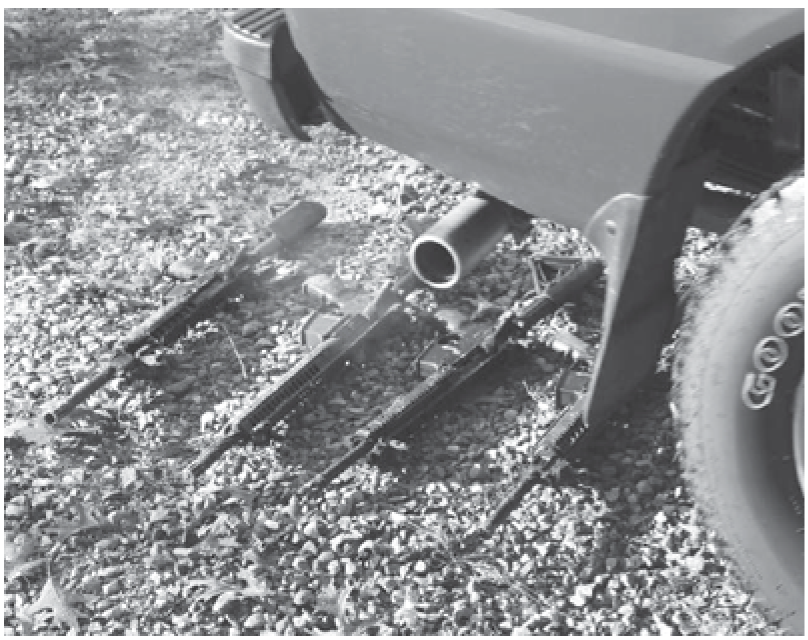
LEFT: The test crew, mugging for the camera as the parked F250 Super Duty diesel idles away.

SCORES

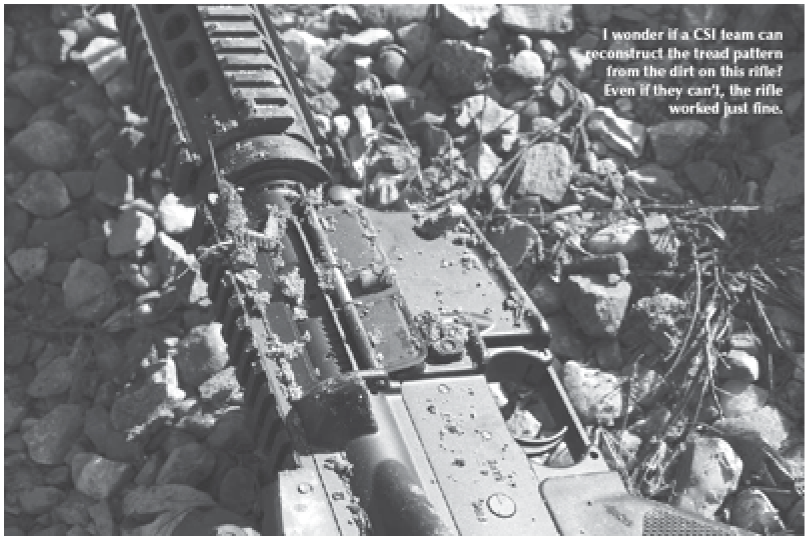
The score so far: impressive. The PWS has visibly-bent handguard rails and the Magpul rear BUIS is trashed, but the rifle refuses to quit. The muzzle brake is amazingly self-cleaning of mud, dirt and other junk. The CMMG has blown the Vortex off (replaced with another Vortex, now) but otherwise works like a champ. The MI

sights and handguards are holding up heroically. The LWRCI rear BUIS is missing a protective wing, but the assembly still stands upright, and can be used as an aiming device. Nothing else on the SPR is broken. The LMT had lost its buffer retainer, the pistol grip is broken but attached, and the front takedown pin is busted but works. Otherwise the rifle functions fine and the sights are durable beyond belief.

Driving over them on the gravel surface has heinously scarred the finish, leaving gouges. In fact, one gouge was so deep it left a sharp spike of aluminum of considerable size, such that I had to take my knife and carve the “spike” off before I could handle the rifle any more. I really didn’t want a toothpick-sized aluminum sliver impaled into my hand.



BELOW: A Ford Ranger, a gravel parking lot and rifles. Yawn, more scars but still-functional rifles.



I wonder if a CSI team can reconstruct the tread pattern from the dirt on this rifle? Even if they can't, the rifle worked just fine.

Before the final test, I shot them for accuracy. At this point I was beyond it all.

TEST SIX

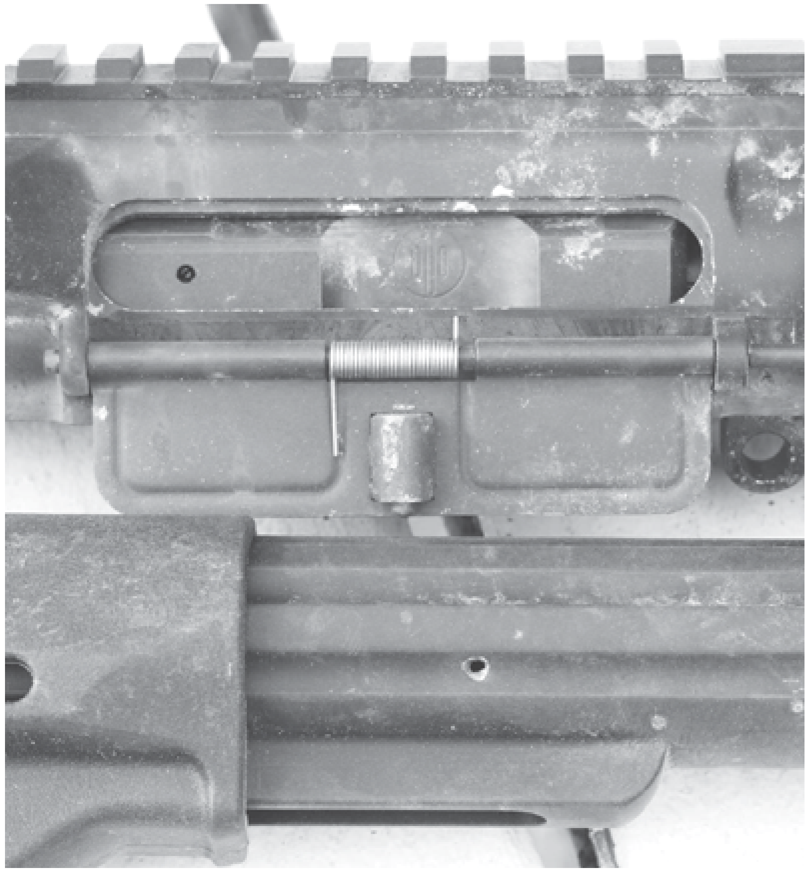
There are those who feel that IPSC/USPSA competition isn't realistic enough. Heck, they even think that IDPA is a little too removed from reality. None of them so far has actually advocated

getting in real gunfights as a training method, but they do advocate paintball or “sims” training. It is good, but it too has drawbacks, and some of the more enthusiastic advocates seem not to realize it. One thing we have learned is that it is entirely likely to get shot in the hands, or on the firearm, in a gunfight. The response to a firearms threat is often to focus on the firearm. Focused there, our responding fire is aimed there. People get shot in the hands, in real life and in sims training. Well, I think we all know what the likely results are to whacking any of these rifles with a 9mm, 40 or .45 handgun bullet. And it would be a serious abuse of the manufacturers kindness to simply shoot their product and send them back with dents and holes in them. So, I started small.

I also test-fired them for accuracy before I took the next step. I figured if I broke any of them, I could not then check accuracy. I used a LaRue mount and Leupold 3.5-10X scope, and took my time with some Hornady 55 grain V-Max ammo, a load that has proven superbly accurate. If a rifle doesn’t shoot this stuff well, then there is something wrong. The results were gratifying: all rifles did well under 2 MOA, and would often post groups right around 1 MOA, even without my having to lay off the caffeine to check accuracy. I will admit that in a perfect world I would have checked the rifles in a machine rest at the start and at this point, to see if there was any small drop off in accuracy, but if after all this they can shoot like this, I figure who cares?

Do you think it cared? At this point with broken parts and heinous abuse, the LMT continued to function.

The LMT MRP, receiving its inaugural load of birdshot.



The one malfunction the PWS suffered – a pellet poked a hole in the flute of the buffer tube. Once I'd slammed the buttstock to clear it, shooting continued.

To shoot them, I loaded each one, laid it sideways on the backstop, stepped back, and shot it with a 12 gauge skeet load, 2-3/4” 12 gauge shell, 1-1/8 ounce of 7.5 shot, at a nice, sedate, 1150 fps. I then picked it up and fired five rounds. Back onto the backstop, another skeet load, and repeat.

The scars on the finish that driving over the rifles produced? Nothing compared to the king-kong-like scuffing that happens when you repeatedly paste them with lead shot.

And here I finally had success. Of a sorts, anyway. Let's first discuss the impact, and then the individual results.

It really shows the marks, but it works. The magazine is ready to quit, but I can't really blame it.

The CMMG, having survived all the tests, takes its hits from the shotgun. And yawns.

The LWRC SPR and skeet loads. No problem, mon.

The rifles were lying on their side on an embankment, so they were at a slight angle to the impact. This did two things: it produced a “slap” against the ejection port cover, and it provided a ramp for the shot to skid up the magazine (yes, I had a magazine in each of them) and into the mag well. I started with the ejection port closed, but on the first shot the cover would pop open, so I just gave up on that.

The shattered shot would be ground to particles and dust, and the impact would drive them through the gaps between the bolt carrier and the ejection port edges. After enough shots, the action would get gritty and stall. However, open up the action, remove the bolt and carrier, shake things and squirt some oil in, and the rifle would run again. That said, let’s go through them in order, and see what happens.

LMT MRP

The LMT MRP had in it the USGI magazine I was willing to sacrifice in the name of knowledge. After the first five-round ground-sluicing, it was a bit gritty, partly from sand and partly from lead. After the second, it was cycling quite sluggishly. After the third five-shot hosing, the action was reduced to a straight-pull bolt-action rifle. I popped open the action (making sure I controlled the loose buffer and spring) shook out the lead and sand, squirted some oil in and kept going. Two more five-shot skeet load bursts and it

was still cycling as a semi-auto. The USGI aluminum magazine was about done, however. The portion below the LMT receiver was clearly dished, and I wasn't sure it would even accept another 30 rounds to do the test again. At the rate it was bending, it was clear the next five-skeet burst would reduce it to the status of paperweight.

Conclusion: The rifle didn't care for being shot, but was willing to keep going as long as I cleaned some of the lead and sand out and hosed in more oil.

Primary Weapon System

The PWS had a Magpul PMag30 installed, and took the first five shots without complaint. The second five-shot pasting turned it into a single-shot. On the first shot after the second pasting, the rifle fired, but the bolt stayed back. I flipped the safety on and slammed the buttstock against a bench. The bolt flew forward. On the next shot, the bolt stayed back, and I repeated the safety/slam. The third shot, it cycled fine and I finished the string.

Here's what happened: the PWS buffer tube ("receiver extension" for you pedants) is fluted, to trim a bit of weight off of it. A single pellet had struck at the thinnest part of the flute and punched a hole through it. The burr on the inside was binding the buffer. When I slammed the buttstock, it jarred the buffer loose and the action closed. Done twice, it knocked off the burr enough to keep cycling after that. So, a one-in-a-thousand hit put it off-line, but only until remedial action had been taken.

Magazines after the hit. The USGI is warped. The Troy is punctured. The Lancer and Magpul are ready to go again. With a new follower, the Troy soldiers on. The USGI, I retired.

Interestingly, after I finished the box of 12 gauge and the magazine, I could not remove the magazine. The PMag 30 was so tough, it shrugged off the pellets. But, its very toughness caused the pellets to skid up the mag tube, and wedge themselves between the magazine tube and the magazine well interior wall. I had to remove the upper and, while pressing the mag button, bang the mag lips against a post to knock it free.

And after all that, it still works just fine.

Conclusion: Short of the one-in-a-thousand hit, the PWS worked through the box of 12 gauge and the magazine it had. Even the sand and lead grit wasn't enough to stop it.

CMMG

The CMMG drew one of the new Troy magazines for its test. It cranked right along until after it had received its fourth set of five shots when it didn't want to feed. On taking the magazine out, the follower had been cracked and was not lifting the stack of

cartridges. So I put another magazine in and the rifle finished the set.

Out of all the rifles, the CMMG finish showed the pellet impacts the most. Where the others showed dark gray spears, the CMMG showed definite center-hits and lighter-colored smears of lead across the surface. The surface roughness is probably the culprit here, the slightly rougher CMMG surface texture allowing the lead to show up more. If that matters, then keep it in mind.

Conclusion: Had the CMMG drawn one of the other magazines, I'm certain it would have finished its ammo supply without a problem, despite the sand and lead bath.

LWRCI

The LWRCI SPR drew the Lancer L5 magazine, one of the earlier ones, and not their newest design. I was curious as to how well the coating would stand up, but I might have saved myself the anticipation. It did better than the standard anodized finishes of the other rifles. Where the pellets impacted perpendicular to the surface, such as on the forearm, they created clear depressions in the surface. Hey, it is aluminum, not adamantium (quick, where's that from?) and I'd expect depressions for a direct impact. However, on a surface tilted to the impact, the pellets skied off, and the scuff marks could be scrubbed off.

The LWRCI refused to choke on the diet of lead pellets and sand scouring. It chugged through the whole magazine, although it did get a bit sluggish near the end. As with the PMag, the L5 proved so durable, it shrugged off the pellets and the pellet fragments wedged the magazine in the receiver.

Conclusion: If any rifle was a winner, it would have to be the LWRCI by a nose. However, it would be the closest of photo-finishes, as what caused the other rifles to stumble slightly were all quirks and subjects of fate.

Final thoughts

After all of this, I have only one conclusion: Of the rifles tested, I would not have a problem taking any of them with me to a dangerous place. Hey, I'm me, and they would have to be test-fired, zeroed and tuned until I was convinced they were perfect, but none of the ones I tested were poor choices for such a task.

We'll have to close this chapter with the thought that as inventive, creative and cruel as I am, I'm out of ideas. Short of simply breaking them (and I have had no lack of suggestions there) I can't come up with tests to check the limits of the AR. This will require more thought, and I will undoubtedly find that even more-extensive testing will be a lot more expensive, boring, time-consuming and exacting. But we have seen some very nice rifles pass through here, haven't we? In fact, all were excellent choices and all proved worthy of the abuse I heaped on them. Let me repeat one last time: I've done this so you won't have to…….. so don't.

EXTRA TESTS

The test rifle, a pencil-barrel carbine that has proven reliable and accurate through the years. Feed it Black Hills ammo and we'll learn something here.

Just to be thorough, and to re-visit some tests that I have done before, I engaged in some extra tests to as much as possible scotch the rumors that some shooters, commentators and pundits persist in continuing. The two in question are the "don't let your magazine touch the ground" and "barrels resting against an object harm accuracy."

Why do this? After all, "everyone knows….," right? Perhaps. And perhaps not.

The "no mags" idea is that if you rest the magazine on the ground, or worse yet, use it as a monopod, feeding problems will inevitably result. Actually, I've had dire predictions of malfunctions,

parts breakages, bad breath, hair loss and severe deductions from your man-card as potential downsides to mono-podding the AR on its magazine. The reasoning goes something like this: in the Stoner system, the magazine is not positively locked in place, like the AK, FAL or M14 magazines are. It just hangs on the magazine catch shelf, and it is only its snugness in the magazine well that keeps it properly positioned. Pressing on the magazine can force it within the magazine well, resulting in its resting crookedly in the magwell, or push it up so that feeding geometry is "off."

The really paranoid think that the AR has such a crappy feeding system, such lousy magazines, that anything you do to the magazine can decrease the already-marginal feeding system. Now, while the early 30-round magazines were a tad marginal, the first ones, the 20-round magazines, were remarkably reliable. They should be, as they are essentially the M14 magazine writ small. And, the current production of 30-round magazines have benefited greatly from decades of R&D, experimenting and more. The last decade has been the de-bugging and refining of the 30-round magazine that the DoD should have done back in the early 1970s. The "rep" of the AR mag is still pretty shabby, with few exceptions.

Nonsense. I've done this before, but I did it again, just so there could be no mistaking it. I took a five-gallon bucket of random magazines with me to the range. They were USGI, Magpul, Lancer L5, Troy, TangoDown, Fusil USA, CProducts, CMMG, SureFire (the 60-round mag) and Tapco.

I took three rifles with me, my Colt 6400, my Rock River Elite Operator, and a box-stock Stag Model 1, their M4 clone.

The testing process was simple. I loaded each magazine full up with Black Hills blue ammo, remanufactured 55 grain full metal jacket, slapped it in a rifle, got down prone and shot the magazine dry with the magazine baseplate jammed into the dirt. While I was doing this, I rocked forward and back every few shots, to present as different as possible a feeding angle. I also pressed down hard on some shots. But all the time, the magazine was hard into the dirt.

Sand, really, but since it is on the bottom, there isn't a difference.

Resting the rifle on the magazines – Does it matter? Well, there's one way to find out, right?

Nobody worries about an AK and the magazine resting on the ground. But everyone "knows" the commie gun is impervious to potential malfunctions. Riiiight.

In all that (I managed to consume two cases of the Black Hills ammo over the course of a number of range trips), I did not have a single malfunction. Let me be clear on this, it was not that I didn't have a malfunction that could not be attributed to the magazines. I had *no malfunctions*.

This is something we learned a few years ago, and once we had enough confidence in it we started applying it to the law enforcement patrol rifle classes. In the several years since we started telling officers to actually and actively use the magazine as a monopod, we have had the same experience. If there are feeding malfunctions, it isn't because of the magazine on the ground, it is because of the rifle itself.

So, magazines resting on the ground is not an issue. Why does the rumor persist? For one, it sounds reasonable, so rather than try to argue otherwise, people just nod and go "uh-huh" when someone tells them to keep their magazines off the deck. And having nodded and agreed, few, if any, will then entertain the notion of testing what they have just been told. Most people do as they are told, and this is but a minor example of it.

Second, there are matches that do not allow the "artificial" support of a magazine on the ground. (Kind of hard to call the earth on which we stand, "artificial" but there it is.) So, if the rules don't allow it, then there must be a good reason, right? And once that line of "reasoning" gets started, it is hard to stop. A parallel example is that of wadcutter bullets in handguns (primarily revolvers) and the thought that "they don't go further than 50 yards." Again, the rounds are soft in recoil, they are low in power, and the furthest target is only 50 yards away. Ergo, they don't travel much further than that.

Rather than depend on such faulty logic, test them yourself. If your range allows it (some aren't keen on prone, or magazine-fed shooting) and you are willing to try, get down in the dirt. Rest your magazine. Push it into the dirt and use it for an aiming support. What you'll find may amaze you.

When I can, I use a refined version of monopodding to improve my aim. I throw my elbows out to the sides as much as possible, while still resting them on the ground. (Long arms help here.) The result is an almost tripod-like arrangement, and aiming is a lot steadier. Now, this is not always feasible and some instructors actively dislike it, as it makes you a bigger target. I figure you can't have too many tools in your toolbox, and if you know about this one, when you need it, there it is.

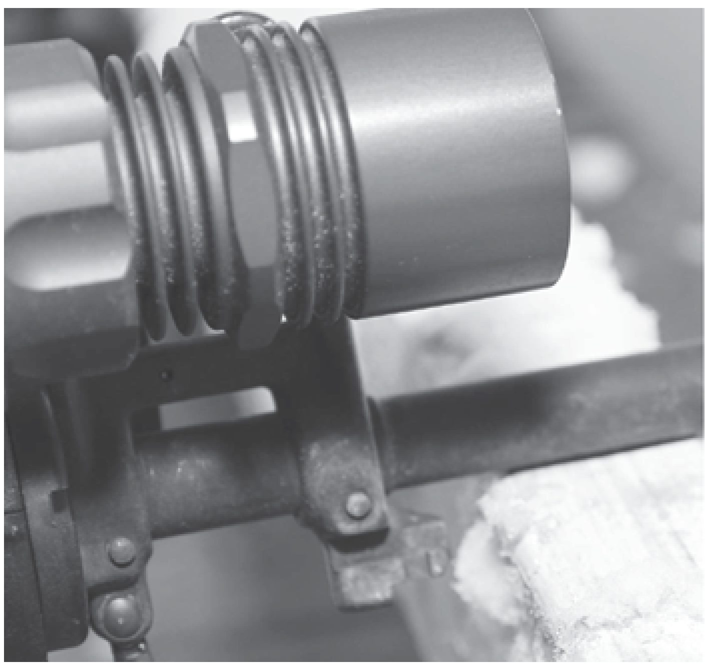
Oh, and as reliable as the 20-round magazines are, they are tough to use as monopods. Well, it isn't the magazines fault that it is so short that only the very trim and youthful can get down low enough to use it as a monopod. And then, only if they do not have a vest, armor plates or other gear on.

In summary, this one, while sounding plausible, is mostly nonsense. There may be some rifles, and some magazines, that will have malfunctions. But the best way to find out is to test yours.

The second rumor is simply that resting your barrel against an object will either destroy accuracy or shift the point of impact. This one requires a bit more thought and planning, First, to see if the premise is valid, we need a rifle with a barrel that would be as much as possible affected by the lateral forces (and changes in vibration) as a starting point.

That would be a 16" carbine inside of a free-float handguard. Bonus points for getting to the top of the list of test potential candidates would be a lightweight barrel (a thin steel tube or rod would be more likely to flex than a thick one would) and one with great accuracy to start with. After all, if (and I'm just grabbing numbers here) we have a rifle that shoots a 3" group at 100 yards, and the test produces a shift in the point of impact of half an inch, how would we notice?

With the magazine resting on the ground and my elbows properly positioned, I have a pretty stable tripod to shoot from.



Barrel contact Test #1, resting the barrel on the edge of a 2X4, just in front of the bayonet lug.

So, that meant poring through the rack and finding a suitable candidate. What I found were three rifles I could use. First up, a pencil-barrel carbine built on a Bushmaster upper and lower using a Colt skinny carbine barrel. It currently has a Surefire M500 light

forend on it, but it has always been an accurate shooter. It does not, as you will notice, have a free-floated barrel. On top it had a Trijicon Acog, TA45-4, a very fast scope in use. Second is my Rock River M4 clone, with a medium-weight barrel, standard handguards and a nice trigger. Last is a LaRue Tactical Stealth upper on a Stag lower. This rifle defines tack-driver. The RRA and LaRue both have heavier-than-pencil barrels, so the changes might be harder to discern. In the end, I figured I could always duplicate the tests with the others, so I simply used the Bushie, and its Trijicon scope to start with. If what I found merited extra inquiry, I'd then add the others to the test.

The start was to create a baseline and establish performance. I also used the Black Hills blue remanufactured 55 grain fmj, as I had plenty on hand and it is accurate ammo. I fired each from the bench, using a rest, to confirm 25-yard zero and grouping. As expected, each of them could shoot ragged-hole groups at 25 yards, and the LaRue in particular could shoot one-hole groups from time-to-time. It would probably be more accurate to say that I could shoot one-hole groups from time to time but not always, as I'm certain the LaRue rifle could do it all the time.

I started with the Bushie, and planned to follow up with the others if I found information of interest. We'll see if what I found is interesting.

Also, I had done a similar test a decade ago. But looking over that test, I realized that I had not been thorough enough, and as a result, the results were inconclusive.

Test #1

I rested the barrel of the rifle on the edge of a 2X4 set on a hollow plywood storage box on the shooting bench. I placed the 2X4 so that it was as close to the front sight housing/gas block as possible without touching the sight. I left the 2X4 loose on the support box, so as to create as much jump and vibration as possible. If this failed to produce measurable results, I planned to then secure the 2X4 to

the support blocks and create a stiffer wooden support. Using a rear bag, I then proceeded to re-shoot groups at 25 yards. I wanted to see if the accuracy suffered, and if the point of impact changed, without the time of hiking to 100 yards and back. If I could not see a change at 25, then the change at 100 would be an inch or two at most, and an inch or two at 100 yards is negligible for defensive use. (Aside from precision marksman/sniper use, but that isn't what we're using a 16" AR carbine for, is it?)

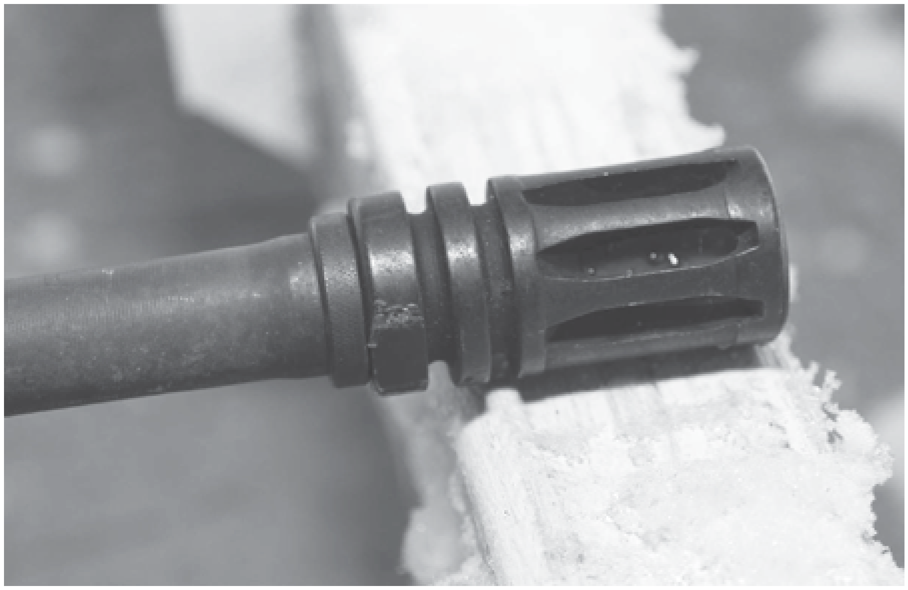
This proved to be marginally productive, and the groups were in no way different in size, but they did seem to be shifted from their usual location. There was a small change in the point of impact, with a grand total of about an inch, directly up. If a quarter-inch at 25 yards translates to one inch at 100 yards, then one inch in this test is four inches at 100 yards. Not exactly a big deal, but enough to be aware of.

Test #2

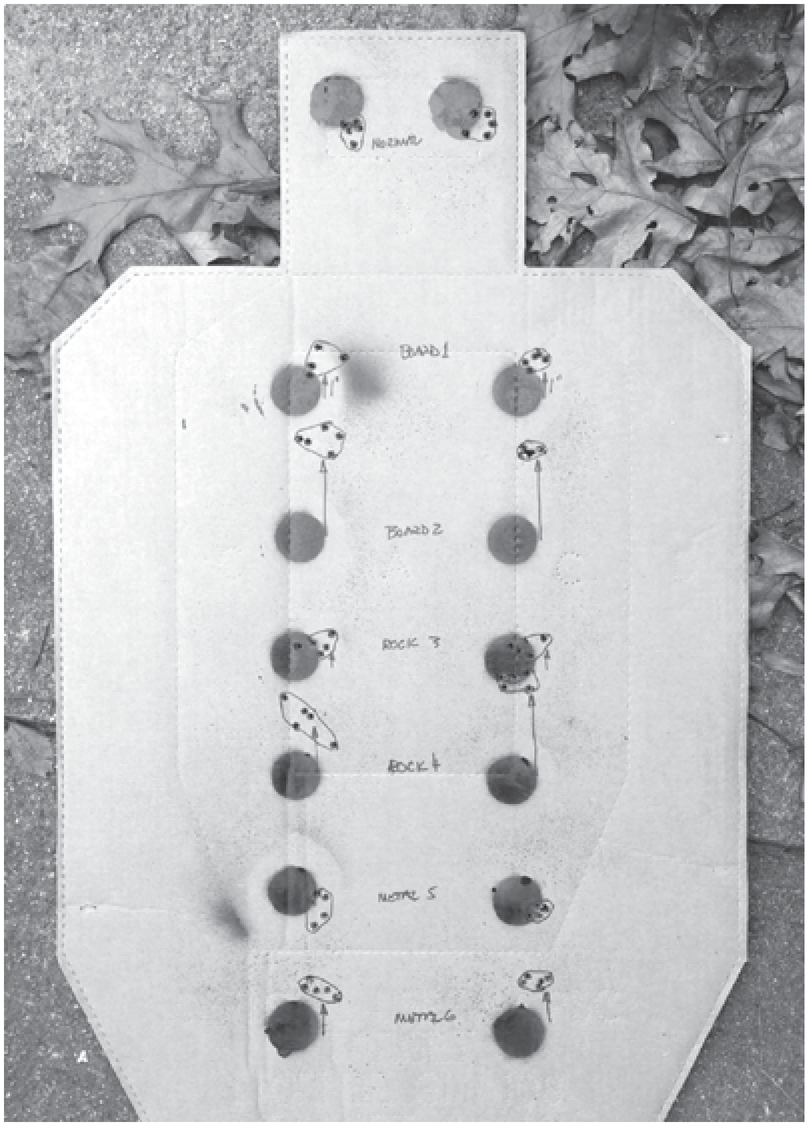
I rested the barrel, at the flash hider, on the edge of the 2X4. I wanted to see if I could induce barrel whip bounce, as the barrel vibration would have greater leverage if it were being interfered with at the muzzle instead of somewhere in the middle. The blast from the flash hider, while impressive in what it does to the support board, is of no concern for accuracy. By the time the gases have an opportunity to vent their spleen and energy against the board, the bullet is long-gone. However, the whip-saw vibration of the bullet firing could result in the barrel harmonics being interfered with.

When you fire a round, the explosion vibrates the barrel, just like a tuning fork. Part of a high level of accuracy is that the bullet leaves the muzzle at the exact same point in its vibration pattern, where the muzzle might otherwise be minutely pointed in another direction if the vibration differs. All other things being equal, a barrel with uniform vibration will be more accurate than one without it. Also, the "walking" you see in a barrel, the shifting point of impact as it heats, is due to the harmonics changing as the heat

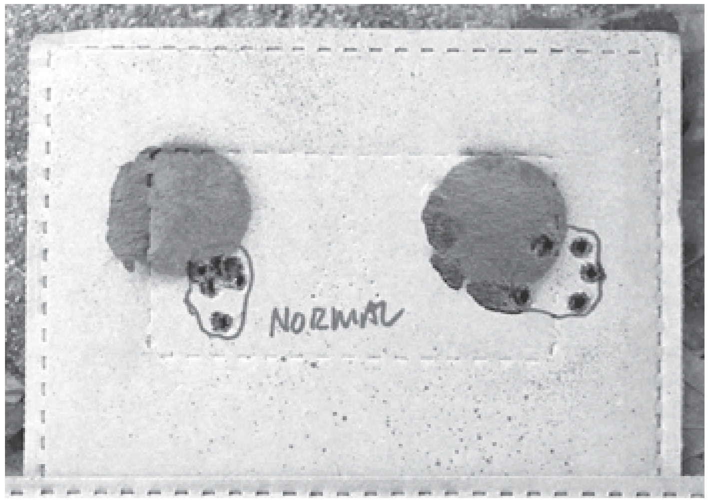
relaxes the internal stresses of the barrel.



The second test, resting the flash hider on the 2X4 and firing for zero.



The preliminary test target. You don't have to be elaborate to test a hypothesis, just careful.



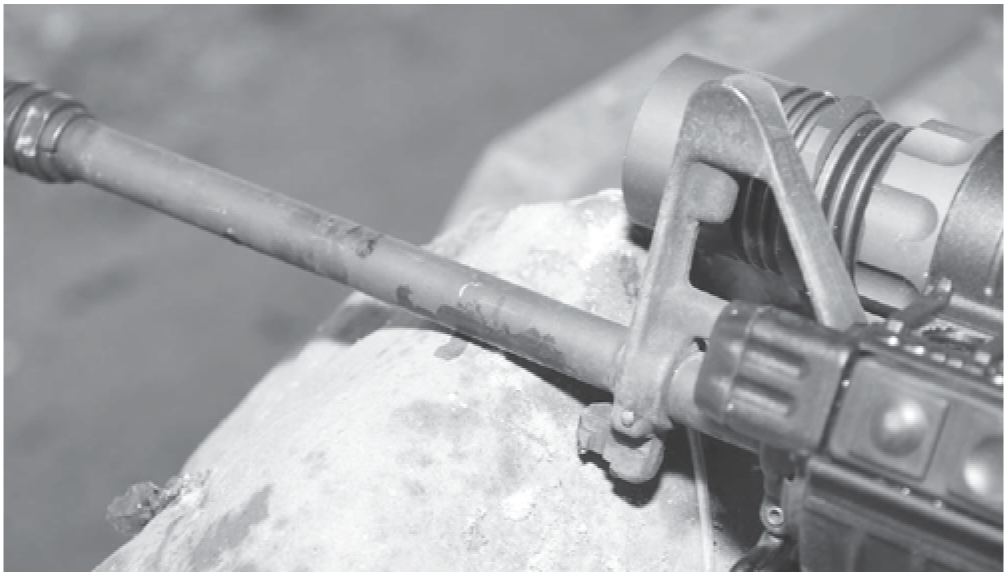
The base groups, fired at 25 yards. No point in walking 100 yards to find things out at the start, right?

Well, here we had success. At twenty-five yards, the bullets struck three inches high, and slightly to the right. This would not be a problem (in most instances, anyway) at 25 yards, but at 100 yards, that could mean a bullet striking a full foot over the intended point of impact.

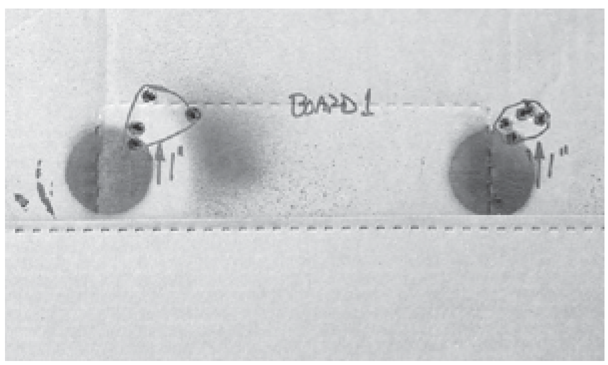
So, if you do need to use a rest, and the only way you can make it work is the barrel, at the sight, resting on wood, you're good at 25, and as long as you remember the difference, manageable at 100.

Test #3

For the next test, I planned to use a concrete block, what many of us call a cinder block. Alas, there had been rain the night before and then freezing temps came, and they were all immovably frozen to the ground the morning I arrived. However, there was a convenient boulder handy, so I pried it up and put it on the shooting bench. This test would simulate resting the barrel on a chunk of concrete blown out of a building, or a convenient rock in the mountains.



Rock test, resting the barrel just in front of the bayonet lug.



The first test, with the barrel resting on the 2X4 right in front of the bayonet lug, caused a minimal zero shift. This looked promising, but things turned out to be a bit more mixed up than this test indicates.

First up, rest on the rock just in front of the bayonet lug. Interestingly, the rock did not create any more of a diversion than the wood had, similarly placed. An inch at most, where I had anticipated a lot more. Again, at CQB distances, letting the barrel at the sight touch the object you are resting on doesn't seem to be a big deal. However, it would still be as much as a foot at 100 yards, so you should exercise caution.

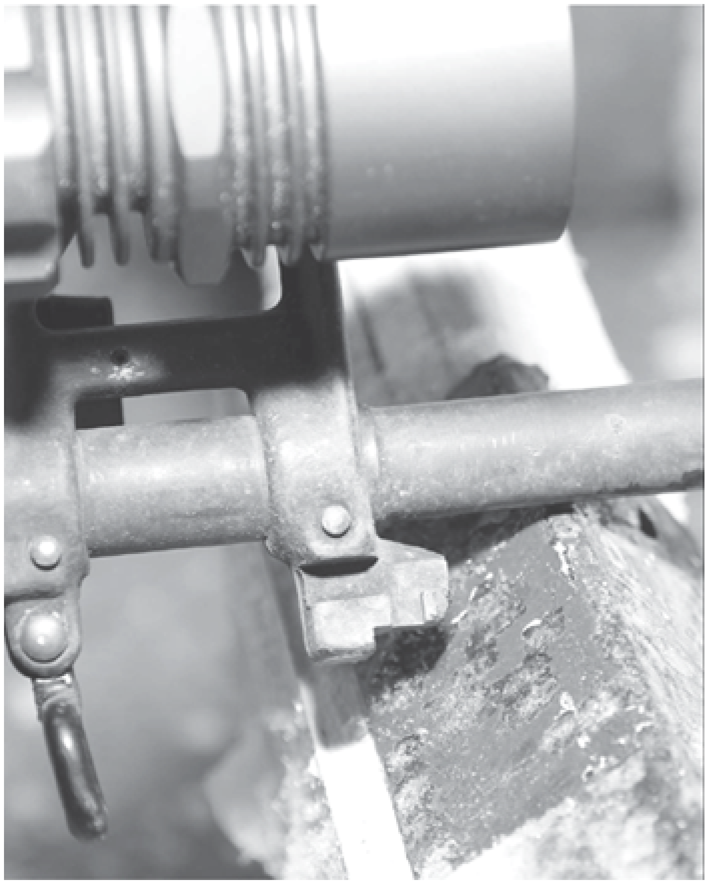
Test #4

Again, resting the barrel at the muzzle on the flash hider, on the edge of the selected rock. A more severe example of the field contact mentioned in Test #3, and additional progress. One group was two inches high, the other three inches higher than the proper-rest point of impact. Clearly, resting the muzzle or flash hider on an object was a bad idea. Two to three inches could result in a miss at 100 yards.

Test #5

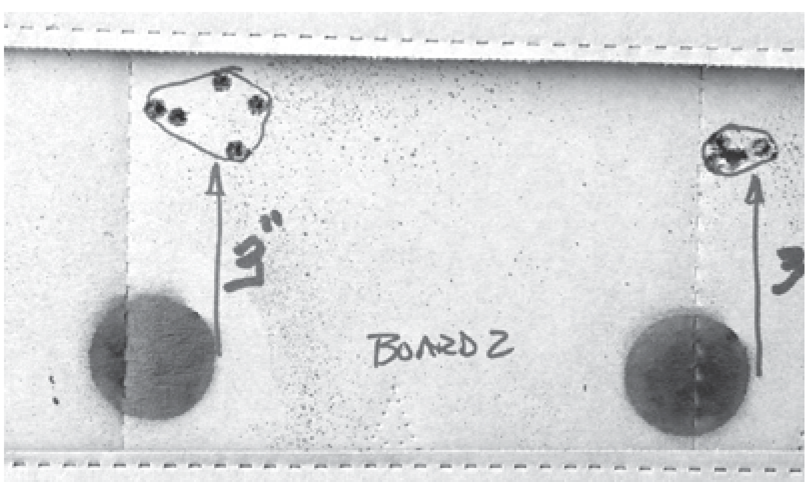
Of all collisions, those of two steel objects are the most elastic. Or rather, have the possibility of being elastic. If you think a tennis ball, dropped, bounces an appreciable height, try dropping a steel ball bearing onto a steel plate.

Second rock test, with the flash hider resting on the rock.

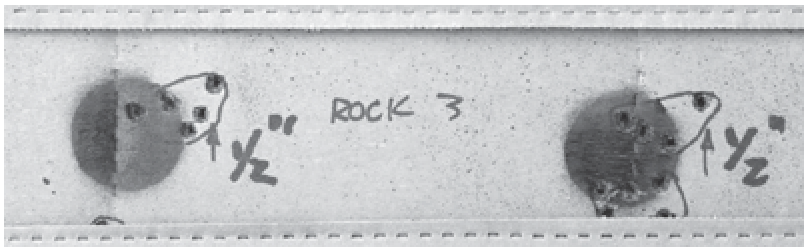


Metal test, with the wood-back steel angle iron contacting the barrel in front of the bayonet lug.

The flash hider-on-metal test.



The flash hider on the board "jumped" the groups two to three inches at 25 yards. At CQB distances, that's not a problem, but it could be at greater distances.

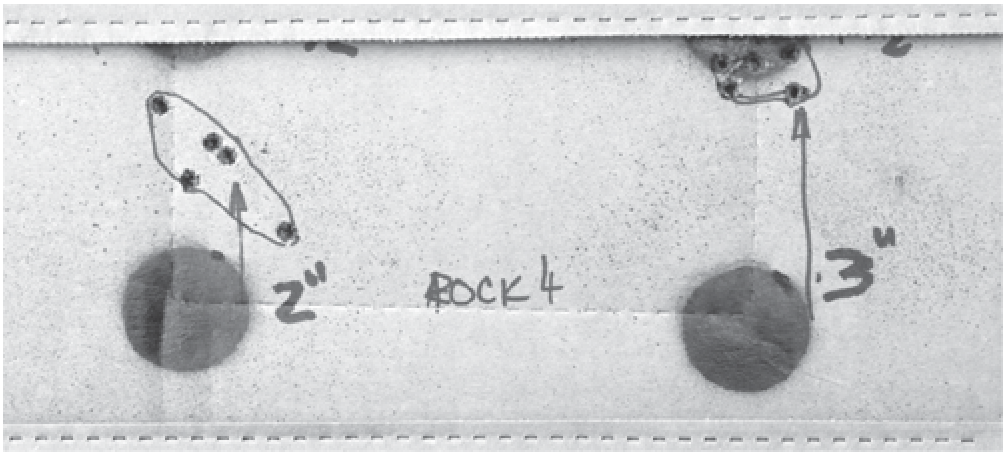


Rock at the bayonet lug test, with a minimal zero shift. That's still "A" zone at 100 yards, no problem.

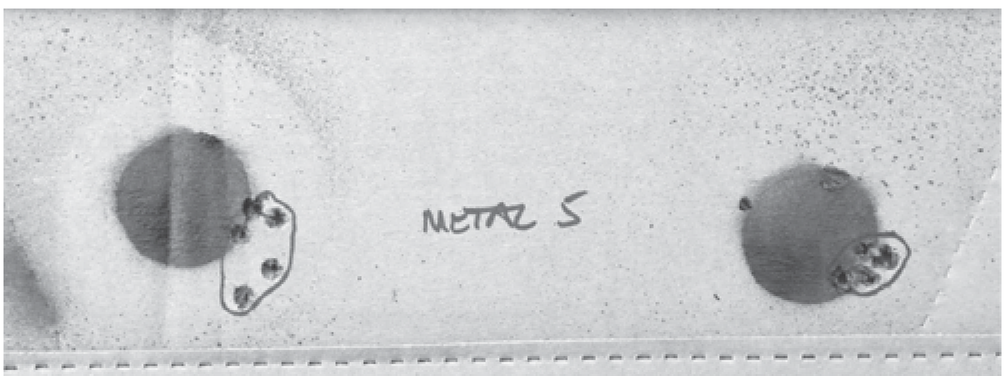
So, in simulating resting a rifle barrel on the edge of a hatch or coaming or the steel rim of a window in a building, I took a steel-faced support from one of our steel plate target holders and laid it across the shooting bench. I then rested the barrel, as in Tests #1 and #3, just ahead of the gas block. The support is a heavy-gauge steel "V" on the front of a standard 2X4. We have been shooting steel for three decades at my club and we've experimented with a lot of designs. This one, while not appearing to be all that robust, has two advantages: it is lighter than an all-steel post, and it is easier to replace or repair. You see, if it is downrange, it will get shot, and we found that while all-steel posts did last longer, they could not be easily overhauled, and once dead, they couldn't be resurrected.

Hence the steel-faced wood.

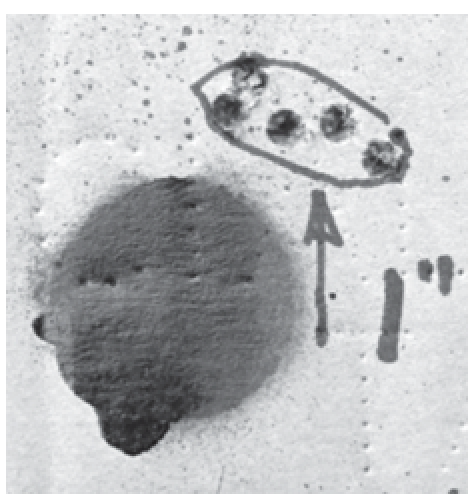
So, I rested the barrel at the sight, on the top edge of the "V" and shot a pair of groups. The groups could have been fired from a proper rest, for all their size and location told me. They were the same size and location as the first groups that I began with. Interesting.



Rock test, flash hider. Here we have a noticeable shift, and three inches at 25 yards becomes a foot at 100.



Again, we see that resting the barrel just in front of the bayonet lug causes a minimal shift in zero.



The flash-hider has more movement than Test #5, but this is still okay for CQB and manageable for out to 100 yards.

Test #6

To cap things off, I rested the flash hider on the steel, while shooting groups. Here, I expected to see results as good (or bad, depending on your perspective) as I had produced with the board or rock. Alas, the results were contrary. The groups were no larger and only an inch higher.

Conclusions

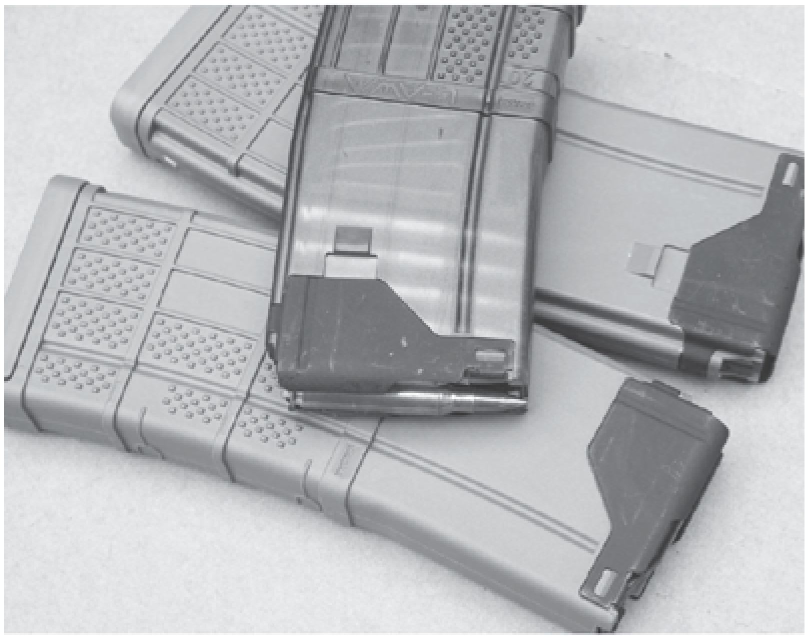
What did this mean? I can't figure this one out, but the conclusion I draw from all this testing is this: if you rest your barrel on something, you are playing roulette with your point of impact. At CQB distances it may not matter, but beyond that it can. Not that it does, and worse yet, it doesn't in any predictable manner. But it does matter, and you should not do it. If you want to try it, do so at close-enough range to be certain of staying on the target. And, your point of impact seems to shift away from the object you are contacting. So, if you rest your barrel on something, your shots seem to go high. If you were shooting around a wall, and rested your barrel against the corner, then your shots would then probably go away from the wall.

But how much, and how consistently, is not something that can be predicted or plotted.

So don't do it.

In this instance, "what everyone knows" seems to be true, but not nearly as badly as the gun shop commandos would expect.

MAGAZINES



The latest Lancer mags, with the steel reinforcement running all the way around the top.

There was a time when the state-of-the-art in AR magazines was the USGI 30-rounder. And it was bad, awful, even. We tore our hair out back then, sorting, measuring, marking and babying out magazines. We'd shoot tons of ammo just testing them, and then if one got dropped on a concrete firing line, we'd do it all over again.

It didn't help that we were still sorting out the persnickety problems in the rifle itself. We probably trashed a number of 100% magazines in the belief that they were bad, when it was probably the rifle's fault.

Well, that is no longer the case. We are in the golden age of reliable AR magazines, and not only are the current ones much

more reliable than those of old, they are so common and so inexpensive that I will offer the following heretical advice:

If a magazine doesn't work to your satisfaction, trash it, buy a new one and don't waste any time bemoaning the "usable" parts that it may or may not have had.

No, I'm not kidding. Magazines are so cheap that there is no point in stockpiling floorplates, springs and followers from otherwise trashed mags in the hopes that they can be used to "rebuild" future magazines. I figure that by the time a magazine spring is worn out, the feedlips are probably also worn, or weak, and there's no point in continuing with it. Now, I have just the opposite attitude when it comes to 1911 magazines, probably a failing of mine. But there I have found that a magazine that fails to lock open when empty, when given a new spring, works fine. My estimation is that the feed lips on a 1911 magazine take less work, and experience less stress, than those of an AR.

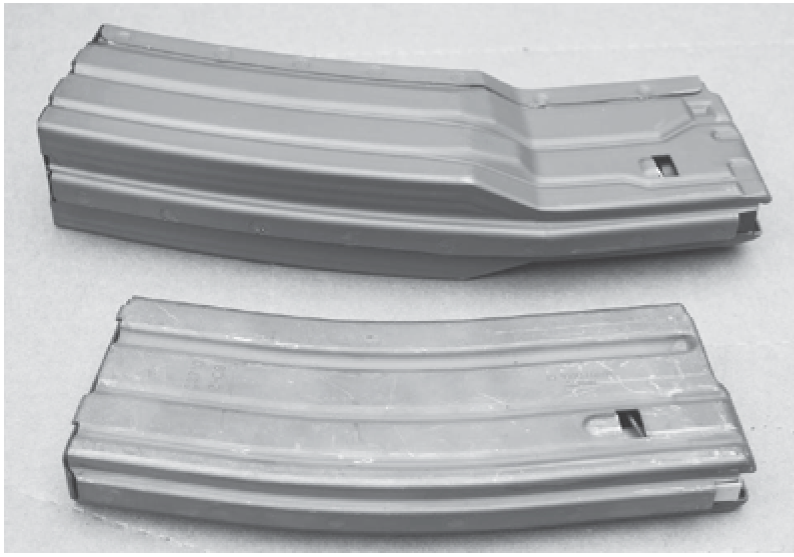
In both firearms, I have enough magazines to fill luggage. So I may be a bit more cavalier than someone who has four of one and six of the other, and is unwilling to forego a pair of decaf skim lattes in order to obtain another one of either type. So be it.

Surefire

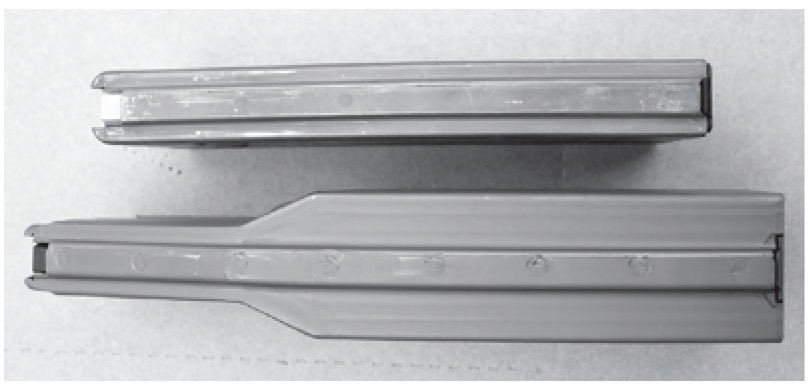
The big news is big capacity. Surefire offers a pair of magazines with capacities of 60 and 100 rounds. And they are not drums, which have a deserved reputation for being cranky at best. No, they are "coffin" mags, a design that has the rounds double-stacked in the upper portion (the part that fits into the receiver) and double-double-stacked below.

The lower portion is actually two double-stacked tubes, side-by-side, that feed into the "normal" portion of the magazine tube. I first read of this in Finnish magazines from WWII for smgs, and ran into working descendants when I was briefly involved with the Spectre smg. That one had a similar design, and a magazine a bit shorter

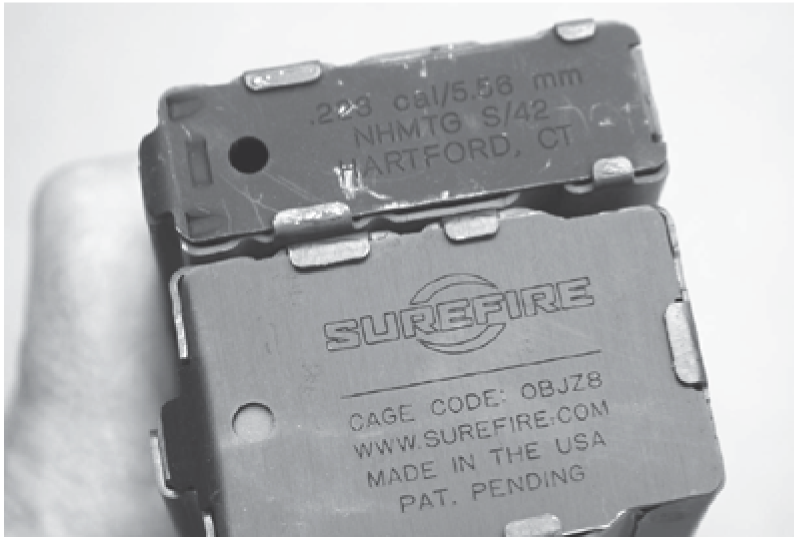
than a normal 30-round magazine held 50 rounds of 9mm ammo.



Surefire does it again. This is a 60-round, quad-stack magazine.



Yes, you will have to modify your mag carriers to put on a vest full of these. And eat your Wheaties.



Don't lose the baseplates, it may be a while before anyone else makes bottoms for these magazines.

The design, as mentioned, is not new, but it is a lot more difficult than you might think to make it work correctly. One of the big problems back in the 1930s, with the Browning High Power, was getting the double-stack magazine to feed reliably. Well, compound that by making the magazine two double-stacks, feeding into one, and then add to it the variety of ARs out there. Surefire wanted there to be no problems at all, so they spent what seemed like an inordinate amount of time testing, tweaking, refining and testing. The end result is a magazine that works. In fact, if it doesn't work in your rifle, I'd be inclined to blame the rifle and not the magazine.

It does have some drawbacks. One is weight. I mean, add 30 more rounds of 5.56, plus the aluminum to enclose them, and you get just a bit portly. Up that to 100 rounds total, and you have 3+ fully-loaded magazines hanging off of your rifle. Also, the length of the magazines makes it more than a bit difficult to shoot from prone. Now, if you are using the 60-round magazines and you are fully kitted up with plate carrier and mags, prone may not be all that low anyway. The 100-round magazine will certainly test the limits of your prone shooting.

But if you are using it from an emplacement, or in a select-fire rifle or carbine as a SAW (something the USMC seems to be headed

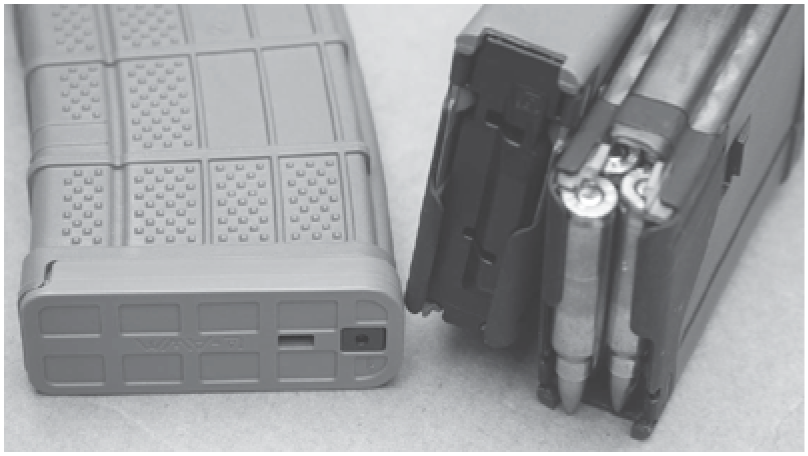
towards), then 60 or 100 rounds is very comforting.

They do make it tough to source magazine pouches. A 60- or 100-round magazine is not going to fit into standard mag pouches. Of course, you have to ask yourself, how many do you need? If your standard load is six to eight 30-round magazines, are you really going to contemplate packing six to eight 60- or 100-round magazines? Going from 210-270 rounds, up to 420-540 or even 600-800 rounds of ammo on your person is a lot of weight and bulk. More likely, the use would be for the AG to be carrying a smattering of these on his ruck and, when needed, producing them for the SAW gunner.

As ambush mags and base-of-fire mags, they would be brilliant.

Lancer

Lancer came out with an interesting hybrid a while back, their L5 magazines. The hybrid part of them was that, while the mag bodies were polymer, the feed lips were steel-reinforced polymer. The feed lips had small steel stiffeners molded into the mag body. Well, they improved on that and the new L5AWM is a steel-reinforced mag on steroids. The steel reinforcement is a wrap-around steel shell permanently bonded to the polymer tube. You get the benefits of both polymer and steel. The polymer is light, translucent (or not, your choice), easy to clean and resists deformation. The steel feed lips bring all the strengths of steel to the table.



The Lancer AWM has steel reinforcements, and a removable baseplate that is ruggedly built.

And, you can have them in 20 or 30 round capacity, and three colors in translucent, or four colors if you can give up the cool factor of translucence.

Plus, if you need capacity, say for a 3-gun match, you can go with the old-style L5 (which have always proven reliable for me) and up the ante with their 48 round L5 competition magazines. The mag is simplicity itself. They take a standard L5, remove the baseplate and use a horse-collar sized clamp to clamp a section of L5 tube to the bottom. *Viola*, 48 rounds. Prone? Don’t be silly.

Magpul

A friend of mine is enamored of 20-round magazines. So much so that he really does get happy at the sight of a fresh supply of USGI 20-round magazines. For him, Magpul now makes a 20-round PMag. Me, I view them as the ultimate TEOTWAKI mag: light, compact, reliable and unobtrusive, for my light, compact, reliable and unobtrusive AR carbine. They do present one problem, albeit a minor one: all the cool tactical mag pouches are built for 30-round magazines. So you may find it a bit difficult, or restrictive as to choices, to build a vest/rig for 20-round magazines.

TangoDown

The best part of most magazines is that you can take them apart to clean them. The best part of the TangoDown magazine is that you can't. The magazine is manufactured by creating a hollow upper tube and a closed-bottom lower tube. The two then have the spring and follower installed and are permanently attached. Sonic welding? Super-strong glue? Harsh language? They don't say, and I don't blame them.

The follower is made with plenty of clearance between it and the magazine tube interior. At least, where it doesn't have to bear to guide. That means that gunk can simply fall out. And if you do need to clean it, you simply dunk it in hot, soapy water, cycle the follower a few times (or not, even) and then let it drain. You could rinse it, if you really felt the need.

The TangoDown magazines come with or without a mag well seal, to keep dust, dirt and god-knows-what out.

Once TangoDown assembles their mags, you don't take them apart.

One aspect of polymer magazines, it is relatively easy for a rifle maker to have brand-specific magazines. If you want mags like this, with your name, just ask Magpul. I'm sure they'd be happy to quote the die costs and minimum run numbers for you. Just be ready to buy 500+ magazines.

Troy

The sights and handguards guys are now making magazines. They are very nice, but in my testing of (abuse of, ed.) ARs, I shot them with a 12 gauge and skeet loads. The USGI magazines crumpled, and the Troy magazines were busted. Of course, it took twenty shots to break the Troy magazine so much that it wouldn't work. I suspect that any of us, taking 20 similar hits, would probably not be working any better.

As long as you are not planning on surviving a hosing from a duck hunter, the Troy mags will serve you well.

California Competition Works

My friend Bill Palazzolo at CCW makes a conversion clamp that produces a magazine your friends will envy. Take the CCW coupler and strip two Magpul PMag30s. Put the mag storage cap on the one that will be the bottom half, and then put in one of the followers, plus the provided extra-long spring. Press the bases of the two now-open magazines together, and use the CCW PMag Coupler to clamp them. You now have a 60-round magazine.

I have to warn you that Magpul did not anticipate this when they designed the magazine cover. It may not be strong enough to both hold the rounds and withstand the impact as you go prone. So, it might be prudent to use some duct tape to keep it secure.

But if you already have PMag30s (and who doesn't?) and you want a big-stick mag for a match, this will do it. If 60 rounds is just too much, then you can go with the 20-30 coupler, which connects a 20-round and a 30-round Magpul together, for 50 rounds total.

Super-sized magazines

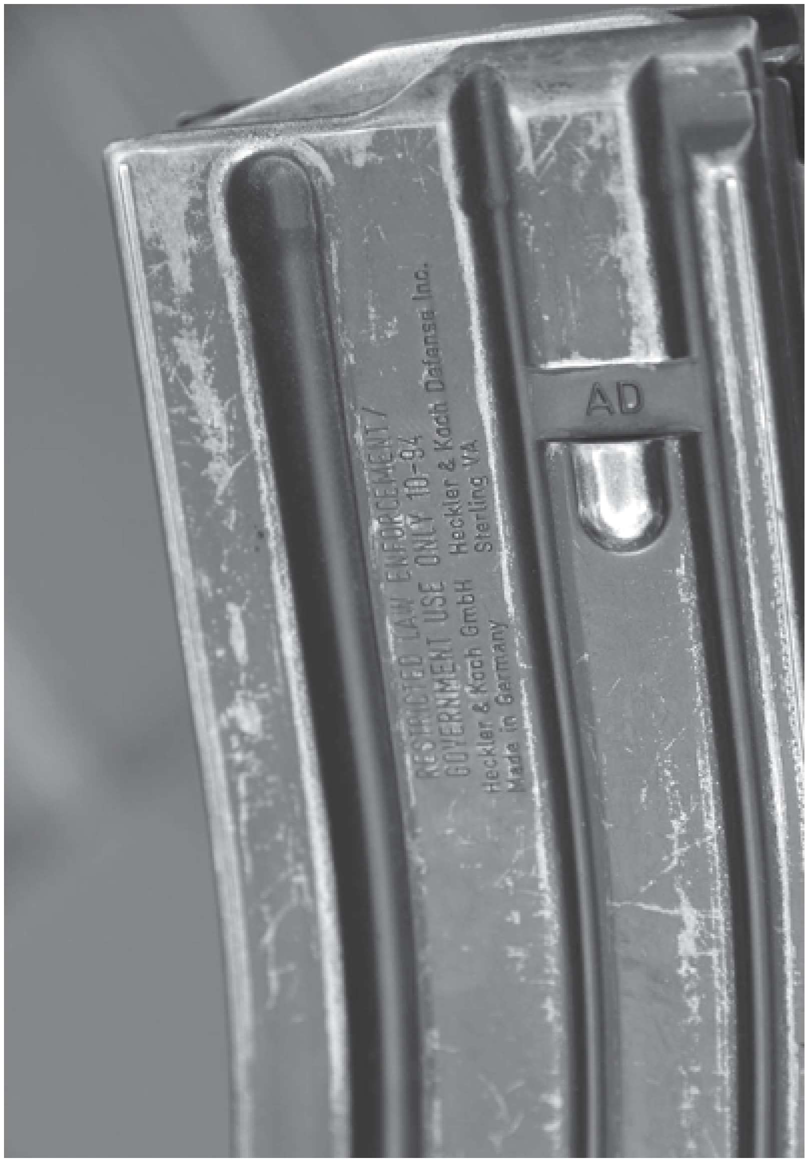
Okay, you are all eager to get yourself a really, really big magazine. Just be careful where you live and where you visit. Some states prohibit magazines over a certain size. As much as it galls me, they have every right to do so. If the citizens of those states don't see fit to vote the ignorant so-and-so's out of office, then they get what they deserve. However, some legislators go above and beyond the call of buffoonery.

Ohio has a prohibition on magazines over a certain size. The limit is 30 rounds, and according to Ohio state law, if your magazine holds more than 30 rounds it is a machinegun. Not "the same as" or "prohibited as if" but the same as a machinegun. This is not like the story told of Abraham Lincoln, who once remarked about dogs, "Calling a tail a leg does not make it one." Nosirree. Because owning that "machinegun" is a felony. This is beyond not knowing technical details about firearms. This is veering deep into the territory of "I just voted the earth to be flat, and I should be fired, disbarred and mocked for having done so."

So keep your 30+ round magazines out of the Buckeye State, because having one there can land you in jail.

HK update

For a while, the HK High Reliability Magazine was all the tacti-cool guys could talk about. People paid stupid-high prices (like $45 each) to own them. They were the solution to all our problems. Well, at a class this last year I discovered just how low the HK stock had fallen. I happened to mention the HK mags while working on a rifle for an officer, and the officer next to him said, “You want some? I’ve got a bunch I brought back. They’re heavy, they rust, and they don’t work any better than the ones I bought, cheap. You can have ‘em.”



For a while, the HK mags were the hot gear to have. Now, not so much. Steel is heavy, for one thing.

The StripLula loads mags fast, provided the rounds are in stripper clips.

Just put the whole stripper clip, with rounds, in the StripLula.

Then run the top handle down to the magazine, loading ammo.
While not as fun as shooting, it takes the drudgery out of loading.

Wow. From uber-mag to "here, take 'em off my hands" in a few short years.

Brownells

The good folks at Brownells have been making some serious inroads into the magazine market lately. They got themselves into the magazine manufacturing business, and did so well at it that they won government contracts to provide USGI magazines. You can get as close to USGI as the Federal contracts allow (there are a few minor details that Brownells must provide exclusively to the DoD) and you can even have them better, if you wish. Magazines in

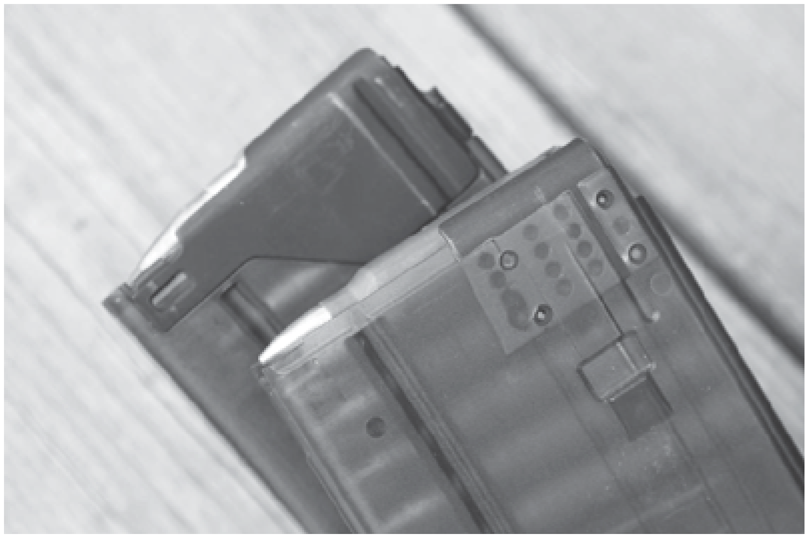
colors, with newer spring steel alloy for the coil spring, and you now have a way to gauge magazines.

Brownells makes a steel magazine gage. In use it is simple. You take the spring and follower out, or learn to juggle the magazine and depress the follower enough for clearance. You then slide the gage down into the magazine tube. The rear slides in the tube and is held in place by it. The top has a tapered section. The bottom is the minimum the feed lips can be apart and still be in-spec. The top, wider, is the maximum width the feed lips can be, and be in-spec.

So, the top taper has to enter, but not pass through, the feed lips. Brownells advises that, if your magazine fails the test, you should use their tool to bend them in the appropriate direction. Me, I had my fill of "tuning" magazines years ago.

A magazine of mine that both fails the gage and fails to work reliably will get junked. This is just part of the testing routine. Magazines would fall into four groups:

The new Magpul fun are 20-round magazines. For a compact rifle, and lightweight ammo feed, hard to beat.



The old Lancer in front of the new. Another advantage of polymer magazines is ease of updating and improving.

- Pass and work.
- Pass and not work.
- Fail and work.
- Fail and not work.

Obviously, working is the trump, and a magazine that works and passes the gage is golden. If it works but fails the gage, it will be viewed suspiciously. And failing is failing, whether it passes the gage or not.

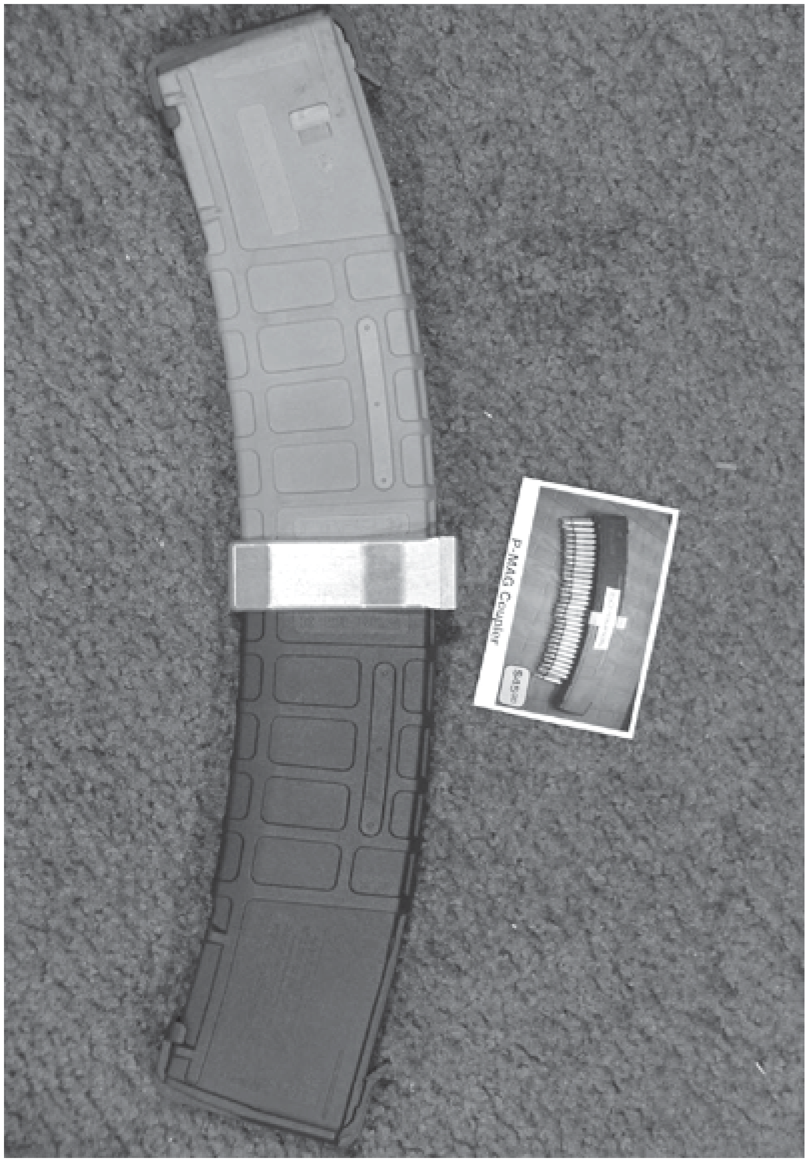
Loading, Loading, Loading….

In any class, you'll see students spending lots of time (hopefully in the shade) thumbing rounds into magazines. Now, this is a good thing, as they need time to catch their breath, hydrate, and even inspect the ammo they are about to shoot. But sometimes you need to get mags filled fast. The government made a good start with stripper clips. But, they are by this time pretty old-hat. As in, they were super-cool a century ago, and even still neat-o when Eisenhower was in office. But now, they are ready to be improved.

The “Lula” folks did that with the StripLula. You’ve seen their other models, where you can load your hi-cap 9mm handgun magazines without wearing out your thumb. Well, this one is along the same lines. A polymer guide to hold the stripper clip and to connect to the magazine, a handle to push and that’s pretty much it, except it is all very much more comfortable than the stamped-steel “spoons” that come in a military bandolier.

As an aside, I’ve been in classes with military personnel, and half the time I get a stunned look when I take a stripper clip, jam a spoon onto the mag, and proceed to strip ten rounds in right quick. Apparently, it is pretty common in the military to tear apart 20-round cardboard boxes and thumb rounds into mags, or even hand-strip them off the stripper clip and shove the rounds in. It is not, as you might assume, such a common practice to use stripper clips, spoons and magazines that everyone in uniform is accustomed to it. Curious.

Anyway, the StripLula makes the whole process so easy you won’t want to do it any other way. If your ammo doesn’t come in stripper clips, you can always scrounge them at the gun club, or buy a fistful at a gun show, and load up your already-inspected ammo. Call it your zombie stash, or your TEOTWAKI ammo, but once you put it in the strips, be sure to seal it up for storage.



Yes it is long, and prone will be no fun. But 60 rounds worth of blasting is good.

A new gizmo here at Gun Abuse Central, the Brownells magazine gage will require a lot of testing to see if it provides useful info.

Ideally you disassemble the magazine to test, but for a quick-n-dirty test, just push down the follower and give it a try.

If you already have some extra Magpul magazines, you can quickly have a 50- or 60-round magazine for competition.

Inspection, Testing And Upgrades

For me, inspection is easy. On polymer magazines, are there any cracks, hideous gouges that would create a problem in integrity, or funky, non-factory parts on them? No? Then they are good to go. Aluminum and steel mags have much the same inspection. Are the welds on the spine all intact? Are the feed lips straight, uncracked and unbent? If there is anything wrong, I toss them. I know guys who have two stashes, the "good" stash and the "training" stash.

I guess I'm spoiled (or perhaps have too many magazines), but I can't accept the hassle and risk of having unreliable magazines as "training" magazines. What if they get into the regular supply? It isn't as if they will infect the good magazines or give them mag-cooties. But do I want to find out on the reload in a big stage of a 3-gun match that this magazine is a training mag? And now I'll get some impromptu training?

Some mags hold up better than others. They all suffer, and you would not want to be holding the rifle that took these hits.

There is abuse, and then there is abuse. Shoot a magazine with a load of birdshot and see what happens.

Coupled with a retro XM-177A1, the Magpul 20-round mags make for a very compact, lightweight combo.

Testing is easy. Load five rounds, shoot dry. Does it lock open? Does it drop free when empty? Load it up fully, fire five rounds. Remove, top-up and repeat. It is usually the first or last few rounds that create problems, no point in shooting extra ammo to test in the middle. Once they pass the tests they go into the “good” pile, which is the only category here at Gun Abuse Central.

As for upgrades, I will admit to doing some. The original follower in USGI magazines was black. If you have one of those, you are probably better off swapping it for one of the green, tan or gray followers. Brownells and Magpul can help you out here.

Also, if you wear your magazines in pouches or vest carriers that don’t let you get a good grip on the mag body, you may want to invest in some Ranger Plates. These are replacement baseplates that offer either a big loop to grab, or a thicker, non-looped base to grab. I prefer the thicker-non-looped ones, mostly for monopodding on the magazine. If you monopod a USGI mag on concrete or some other hard surface, you really grind the tabs and edges of the magazine into an abrasive surface. The thicker plates offer a stand-off from the concrete, protecting the edges and retaining tabs. I admit it is a small thing and probably doesn’t matter, but it makes me feel good.

Springs

When I strip a USGI mag for cleaning, unless it is visibly shorter than a new spring, I don't worry about it. People obsess about springs and materials, wanting music wire, chrome-silicon, stainless, plated, painted, coated, blessed and who-knows-what from their springs. If you live someplace where corrosion is so bad you have to worry about your magazine springs, you'll find you have bigger problems than just mag springs. As in, how to keep the steel on your rifle from rusting, and how to keep slime, moss and lichen from growing in your boots.

Magazine Abuse

My idea of magazine abuse, as a testing procedure, is to load them up and shoot with them. I don't really see much point anymore in dropping them, running them over (unlike rifles) or hosing them with all known solvents.

Modern magazines are now common enough and cheap enough that I can't spend any time trying to resurrect a dinged one. If it gets damaged, it gets tossed. Sorry, but I guess I'm just a cruel, heartless guy when it comes to ammo-feeding devices.

OPTICS & SIGHTING GEAR

Not only is the 6X48 big on a rifle, but it takes up so much rail estate there is no room for a back-up iron sight.

In the old days, a scope on a rifle meant it was a sniper rifle and, as such, had to be treated with kid gloves. Back in the Vietnam era there was a brief attempt at putting a scope on every rifle. The Colt 3X scope was interesting then, and is a sought-after collectible now. As modern as it was, it is pretty tame now, and its limitations show.

We are in the middle of a revolution of sighting gear. Oh, I'm sure you thought that happened some time ago. Depending on how old you are, you may remember the idea that scopes on hunting rifles were just an affectation. Later, the idea that a scope could be used

on a military rifle that wasn't a sniper rifle was heresy. And now? You can scour the photos coming back from Iraq (at least, until we leave Iraq, leaving behind more military equipment than we abandoned in Vietnam) and Afghanistan, and search in vain for a rifle *lacking* optics. Well, at least a rifle that is an M16 or M4.

These days you can see a scope on just about every rifle and carbine, and even most of the machine guns, in the places where we are currently and regularly shooting people. The military tends to favor "one size fits all" approaches, but there is still some variety, in part because a lot of unit commanders are a lot more concerned with food, water, ammo resupply, and keeping the village elder in the loop, than what new-and-improved scope the latest replacement thinks will solve his problems. As long as his scope choice doesn't attract more than its fair share of incoming, it is no big deal in a lot of units.

We, of course, have little in the way of restrictions in that regard. So, we're going to consider a lot of the optics you might want, lust after, or just want to know about.

Leupold CQBSS

Man, whatta scope. First, it is a low-powered variable, from 1.1X to 8X. At the low end, the 1.1 power, it is a wide-open field of view scope that you can use quickly.

There are two places to put a reticle, two locations in the tube where the light path is focused, and they have been named the front and rear, or first and second. The CQBSS has a front focal plane reticle, which means as you change the power, the apparent size of the reticle changes. As you zoom up (or in) the reticle gets bigger. Why? Because when you do so, the relative size of the reticle to the target does not change. And you can use the reticle as a range-finder. (From surveying, and classic sniper scope use, using mil-dots as a rangefinder, like a survey crew would.) If the reticle stayed the same apparent size in your field of view and as you zoomed the

image got larger, you could use the reticle as a rangefinder only at one particular power setting.

That means at the 1.1 setting the reticle is pretty small. No problem. The CQBSS has an illuminated reticle. Turn the power on, and the reticle glows. You can use the glowing reticle as a fast-shooting close range red-dot scope, or zoom the power up and get to a reticle size you can use. Your choice.

The Leupold CQBSS is one industrial-strength piece of optical aiming gear. If offered, don't turn down a chance to try one.

Oh, and the power setting? On most scopes you turn a ring on the scope. On the CQBSS, you turn the whole eyepiece. No fumbling around for the power ring, just grab the whole back cylinder and turn.

The CQBSS has a bullet drop compensator, so once you know the distance to your target (mil-dot, reticle or an accessory laser), you just dial it to that figure, hold and squeeze. The windage and elevation adjustment knobs don't have covers. They have locking knobs that you squeeze to unlock. Squeeze, move, let go, it locks.

The reticle, the M-TMR, has elevation marks, windage marks, and hashmarks on the crossbar, so you can adjust on the fly if you have to. There is one curious aspect to it, however, the M-TMR is meant for the Marine Corps. And the reticle, while being a very useful one

for rifles, is actually meant to be used on M2HB machine guns and Mk19 grenade launchers.

I know what some of you are thinking: a scope on a machine gun? Well, we've seen plenty of M249s, and M240s in the field with scopes on them, but this is meant for a slightly different use. You see, units are under-strength. Even if a unit leaves the US at full strength, as soon as they get into the field they start losing people. Oh, not lost as in killed (although that does happen, it is a war, after all), but a sprained ankle here, the flu there, a dropped wrench and the visiting dignitary "needs" more security. When a unit hits the field they need every pair of boots combing the terrain, that leaves fewer on overwatch, on the vehicles.

With a scope and a ranging reticle, a marine on an M2 or a Mk19 can still do well without an assistant gunner. He can't do without someone watching the team's six, but the Marine using that pair of eyes can't be an AG while also watching the teams back.

The optics are state-of-the-art, coated, coated again and coated who knows how many times, for clarity, contrast and light transmission. It may seem odd, counter-intuitive, that a coating would increase light transmission. Basically, uncoated glass reflects light. Coatings prevent reflection, and thus light loss. Also, reflected light inside of the tube causes glare, further hindering a good view.

Now, to get the performance you desire, Leupold had to go an extra step. Instead of a mere one-inch tube, or even the metric step up, they went with a 34mm tube, which will cause problems when it comes time to source scope rings. Unless you ring up LaRue, and they have plenty of 34mm adapters or mounts ready for you.

There is also the matter of weight. A scope with a 34mm main tube is a big chunk of aluminum. Add glass, and it gets heavier. Make it just shy of a foot long, and it becomes a real serious hunk of optics. At a smidge under 24 ounces, it is nearly a pound-and-a-half of optical goodness. Add in a mount, and we're past two pounds added to your AR. For a scope meant to be used on a Browning .50, or a 40mm grenade launcher, the weight is nothing. But for an AR,

it adds up fast. I hope you started light, because if you opted for a heavy barrel, your rifle is now past ten pounds, and you haven't added any other goodies yet.

And last, the biggest obstacle of all: cost. Consider what you'd pay for a first-class scope. Then make it tough enough to withstand military use, that purchase the USMC has made to mount a bunch of the CQBSS on M2HB and Mk19, remember? They spent 2.43 million for 728 scopes. That comes to $3,400 each. Ouch.

Despite that, Leupold can't keep up. They filled the Marine order, and they can't make more fast enough to satisfy everyone else who wants one.

Trijicon

You say "Trijicon" and the first thing that comes to mind is the Acog. The photos from the desert are full of Acogs for one simple reason: the Marines adopted them, they work, and as a result the Army did too. The Acog is a product of not just thinking out of the box, but ignoring any box-like structures. Instead of an aluminum tube stuffed full of glass, Trijicon went at it from another direction. They designed the optics, then went the extra step and designed an aluminum housing to hold the glass. That means an aluminum forging has to be machined to hold the optics. That means more cost. An Acog of "only" 3.5X will cost twice what a straight 4X scope built on a tube would cost. It is also half the length and has a built-in mount, but that's part of the design.

They also brought with them two ideas that originated with Trijicon: tritium and fiber optics. Tritium is the radioactive isotope of hydrogen, where the nucleus holds one proton and two neutrons. (Normal hydrogen has one proton and no neutrons.) When the electron in each atom of Tritium decides to jump ship, also known as decaying, it does so in an orderly manner. Known as the half-life (the time in which half the isotope decays into its lower-energy residue) Tritium loses half its radioactivity in twelve years. When the electron leaves, the energy it takes with it is enough to energize

phosphors. So, the tritium decays, and as it emits electrons those electrons make phosphors glow.

The Trijicon 6X48 is big and tough. Meant for use on machine guns and grenade launchers, it is big even on the .308. Yes, a .308.

Inside of each Acog is a minute amount of tritium. On the reticle, there is phosphor in the shape of the aiming point. As the tritium decays, it lights up the phosphor reticle. You have a night sight. The human eye is remarkably sensitive, so you don't need much to see at night. However, in the day, there isn't enough tritium to power the phosphor, so you need something else.

A fiber optic takes advantage of a property of light: reflection. If light enters a tube, it is refracted by the surface of the tube and changes direction slightly. If the tube is made of the proper material, the light will then carom down the tube and not escape from the sides. The angle of incidence inside the tube is not great enough to allow much light to escape. In effect, the ends of the tube "glow" with the captured light. What Trijicon does is take advantage of this and use the captured light to illuminate the reticle. In the daylight, the reticle glows from daylight. At night, it glows from the tritium.

Trijicon has been so good at this that reports back from the troops indicate it is too good. In the bright desert, the reticle glows so ferociously that you can't use it as an aiming point. They actually

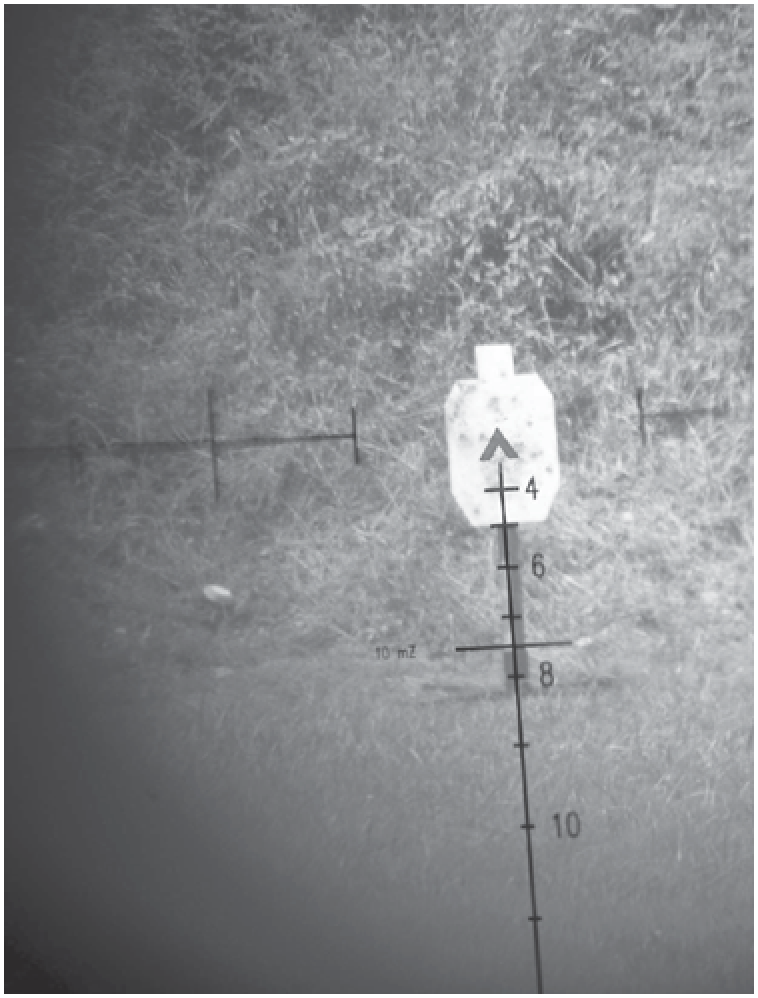
cover up half the fiber optic collection tube (duct tape is a wonder, isn't it?) and in essence dial back the power.

The Acog is fast to use, and the reticle is simple and easy, regardless of which one you select. You can start religious-level arguments over reticle design, and my choice is simple: whatever is in the Acog I'm using. I really don't care.

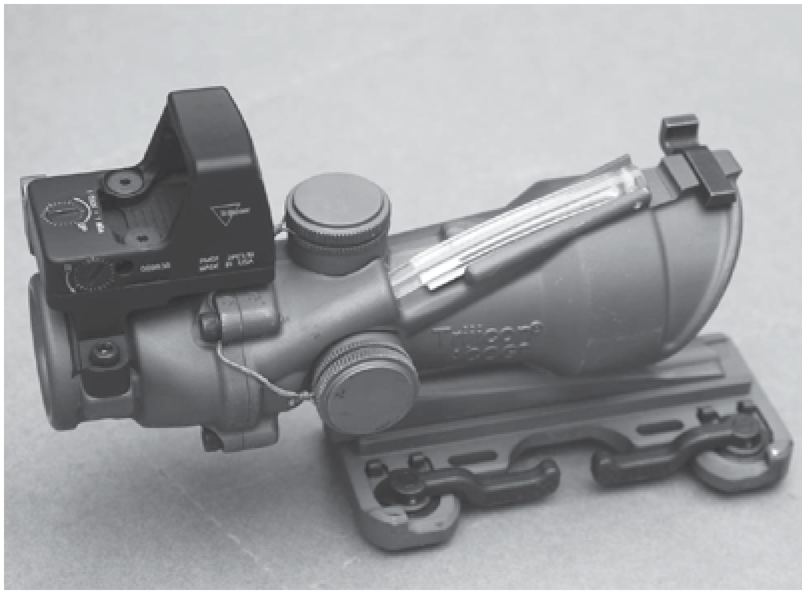
Now, the choice of but a single magnification can be a problem. If you are doing room-to-room work, you don't need 3.5X or 4X, or whatever else you have. If you are in the wide-open, you need more than "just" 3.5X. And what if the scope breaks. Yes, Trijicon makes tough stuff, but they are made, in part, from glass. And we all know what can happen to glass.

So, Trijicon puts backup iron sights on the Acog. Well, some of them. You have lots of choices when it comes to Trijicon, that's for sure. The sights, unlike the typical folding BUIS, are emergency-use only. You are not going to win a match with them, what you are expected to do is keep the bad guys at bay while your buddies, the ones with un-busted optics, settle accounts. This is not a slam at Trijicon, there is only so much they can do on a scope that compact.

Now, 3.5X indoors is no fun. So, why not mount a red-dot optic, something compact, on the rifle? Trijicon did so, at the request of the guys in the field. With all due respect to the guys on the sharp end, they did it wrong. The red-dot optic on the Acog is mounted up on top of the scope.



6X, through the Trijicon scope, provides you with this view at 100 yards.

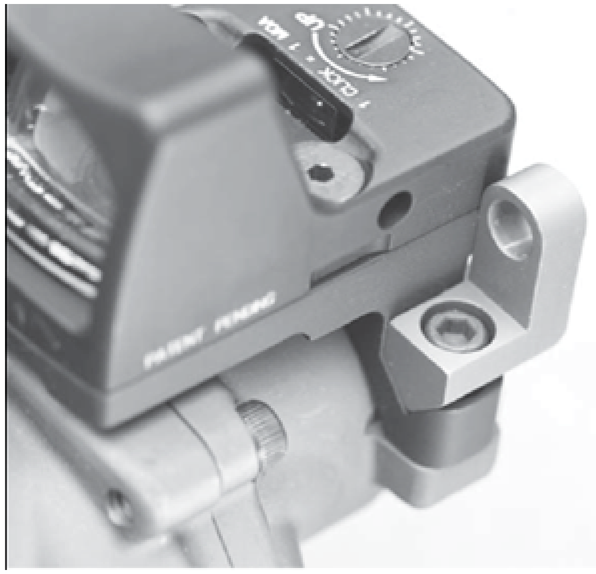


The Acog, here a 4X32 ECOS in flat dark earth, is a tool used to brilliant effect overseas.

One of the things we struggle with in patrol rifle classes is reminding people that the sights are above the bore. Above them by a significant amount – 2.6 inches. So, if you have to shoot someone across the room, your bullet is going to hit low, below your aiming point. Well, the red-dot optic on top of the scope just makes things worse. Far better to use an angle-mount, and put your red-dot optic (compact version) on the side, where a quick partial rotation of the rifle brings it right to the eye, like the Dueck Defense sights.

Acog Big Iron

Okay, if you just must have the biggest, baddest optics available, you want to hunt down a 6X48 Acog. The 6X power is one clue to its use, but the various reticles you can select from are a big hint. You can have a chevron (upside-down V) or a horseshoe, and the vertical bar with hashmarks can be had with ranging marks for .223, .308 and .50 BMG. Yes, a full-on Acog for machine guns. Of course it works on rifles too, since it has, like all Acogs, a Picatinny rail mount built in.



The rear, emergency iron sight built in.

The front blade of the emergency sights. Yes, you can adjust them, but don’t get too wrapped up in it, they are only as precise as their four-inch sight radius allows.

The fiber optic collection tube on top. In extreme bright, the troops have been partially covering the tube, so it doesn't overwhelm their vision.

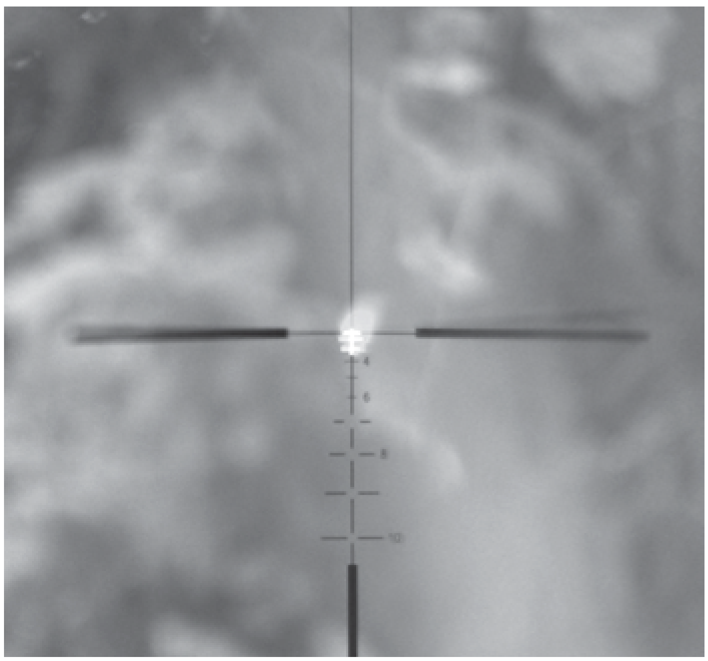
In a moment of beating Murphy's Law, I had an afternoon with one of these beasts, and I also happened to have my camera bag along. Armed with a proper macro lens, I was able to steal the rifle away while it cooled and take some proper photos of the reticle on a target.

Own The Night

Back in Vietnam, we first fielded night vision gear, also known as night vision optics and night vision devices. I'm just going to cut to the chase and use the all-purpose acronym NVG. Actually, we fielded NVG earlier, in Korea. But those were active systems. They were mounted on M1 carbines, marked M3 carbine, and used an infra-red spotlight and an IR viewer. To someone else with an IR viewer, you were waving a spotlight around.

The Vietnam era scopes, known as "Starlight" scopes, were passive. They simply amplified the existing light. They made things-only-dreamed-of possible, and they made it clear to the US army that there was a future in certain electronics.

How do they work? Basically, the heart of a NVG is the photocathode plate. Light striking the plate is recorded, and the signal of that impact is then multiplied. Like the amplifier in your stereo (I admit, old technology for comparison, but those who play electric guitar will get it), you are greatly increasing the signal, but also some noise. Improved electronics have allowed us to magnify the received light a lot more than we could, and produce an image. The image comes when the signal from the plate and magnifier combo is projected onto the screen, the green image we're all familiar with.



The glowing dot, over-driven by too much light, blurs. If you see this, you need to start covering the fiber optic tube.

The electronics are all dead-simple and understandable. The photocathode plate, however is another matter. Making those is more art than science, and when a batch is done the work begins. They are inspected, graded and sorted. The US government has a standing order with the few companies that make these gizmos, and the government lays claim to all those made in the highest quality grades. They go into the units shipped to our folks in the armed forces.

What's left is for us. Which in most instances is quite good, just not always good enough to fly choppers by. I was on a rifle class when we hauled out the AN/PVS-7. This is the military monocular/binocular sight, that in the latest version (7D? 7E? I've heard both) is used extensively by the military. When I attached it to my helmet, turned it on and swung it down, the view was okay, about what my commercial units did, but with a lot more "sparkles." As we were discussing the targets up against the treeline, the instructor looked over and said, "Oh, I didn't take off the day cap." He grabbed the AN/PVS-7, whichever, and suddenly the night was bright. Too bright, I had to turn down the gain.

Wow. I could recognize faces at more than CQB distances, and I could distinguish objects at the back of the 100-yard range. This on a moonless night with a few building lights nearly a mile behind us.

The first generation NVGs had shortcomings. Battery life was short. Plate life was short, on the order of a thousand hours. The image would "bloom" from a too-bright light source, and if you weren't careful you could burn out an essential part of the unit.

These problems have been solved, or at least mitigated. The NVG device family went through a second generation and into a third. Some manufacturers call their products Gen 3+, or Gen 4, but the military hasn't laid down the specifications for anything past 3, so it may be better, and it may just be different.

The best right now have a unit life of 10,000 hours or so. That means, if you are a serious hog hunter and go out a couple of nights a week and keep your Gen 3 NVG on for three hours each night, you'll get four-and-a-half years of use out of your system. Now, they do cost. They may be as little as five grand for a top-end system that is a military refurb, or twice that new. You can spend less, I've seen surplus and Gen 2 units for two grand, and some large, heavy surplus ones that make your rifle a real anvil for less than a grand.

The best allow the armed forces to own the night. No one can operate in the open at night when they are being watched. And since the systems are passive, watching doesn't disclose itself.

Given that they can't be exported, the market here in the US for NVG is part of the "man jewelry" I mention in the SBR chapter. Seeing in the dark is cool. Shooting safely in the dark is even cooler. And if you are doing this for animal control, i.e. shooting destructive hogs to save a farmer's crops, then the coolness factor goes off the charts.

Yes, there are those who have bought and stored their NVG for TEOTWAKI, but a lot more owners want to use them, and that means night-time predator control.

Boost to passive

Since the units amplify existing light, if you add a bit, you get better viewing. The trick is to add light that doesn't reveal itself. Simply, NVG systems are sensitive to infrared light. So a small IR flashlight will boost visibility, albeit at the cost of showing yourself to someone who has NVG. Since that is mostly us, it isn't a big problem in military uses. For the rest of us, an IR source can be a big help. They do, however, tend to be pretty low-powered. You may have a tactical flashlight that powers out 100 lumens of white light, but the IR equivalent pushes a small fraction of that.

For the military the answer is lasers. The AN/PEQ-2 or 2/A is a laser projector that beams in the IR spectrum. In the narrow beam setting, it sends a tight beam that is seen as a dot on the target. With NVG, you (or your team) can see exactly where the beam hits. This is useful to machine gunners and snipers. Also, the beam is "seen" by smart bombs. Let's say you want a bomb (pick a weight) to hit exactly where you want it to, and not anywhere else. So you have an F15 Strike Eagle, circling at 30,000 feet, pitch one off. As long as the target location is within the cone of maneuverability, the bomb will see the dot, adjust its vanes and zoom in to the exact spot indicated. Woo-haa, one pesky thought-to-be-armored bunker gone.

In the wide-beam setting, the laser acts as a really strong IR light source, one your NVG goggles, sight, whatever sees and changes into a visible image for you.

At the high power setting, the AN/PEQ-2 can cause eye damage, so the 2A has a blue locking block that blocks it from the high settings.

The ATN Night Arrow 4, on an SBR with a suppressor on it. Getting ready for some night work.

ATN

ATN Night Arrow 4

The NA4 is a weapon sight, which means that in addition to having NVG, it also has a reticle for aiming. In this, it has an illuminated reticle, so you can use it day and night, with the reticle lit or not lit. As a day system, it and you won't be happy. You're asking a lot of a Gen 2+ system. Battery life isn't a problem, as it

uses vanilla-plain AA batteries, actually just one of them. The mean time between failure (MTBF) is 5,000 hours, so our pig-hunter would have over two years of use, on average, before it needs to be refurbed. The listed battery life is “only” 30 hours, but considering that it is a AA battery, and you can use rechargeables if you want, that is hardly an obstacle.

To boost viewing, it comes with an IR module, which you can either attach to the sight (if you’re in the habit of swapping the sight around) or just attach to the rifle itself, where you can turn it on or off with your support hand.

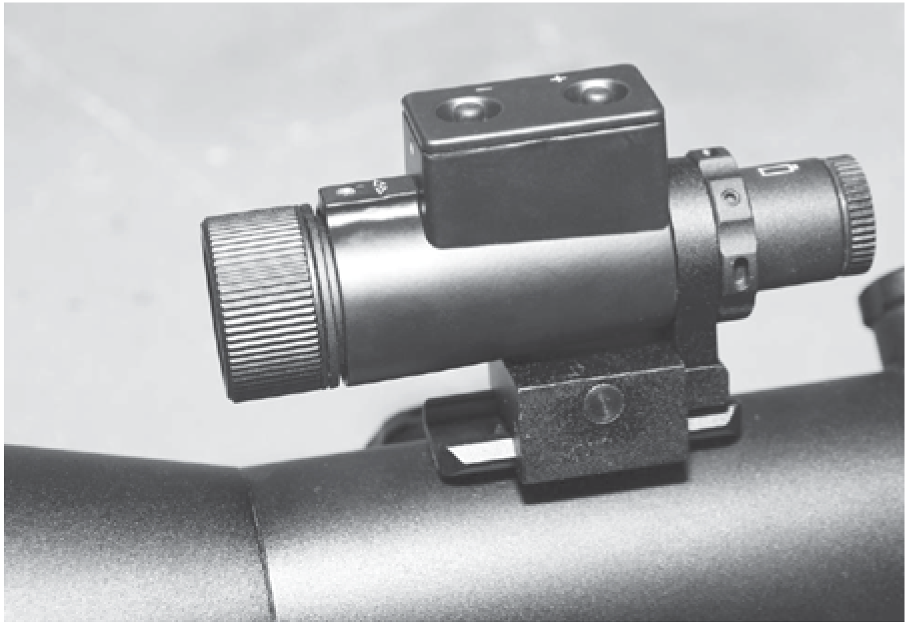
Given that it has a built-in reticle, lit, and while usable in daytime, isn’t happy with it, I’d use the Night Arrow 4 on a dedicated night-time upper. If you’re going to go out on hog control, you’ll be using something suitably-chambered for hogs, and for that just use a dedicated upper or rifle. The Night Arrow 4 lists for about as much as a rifle does, so you aren’t breaking the bank while you’re hammering the porcine population.

With all the other gear one can put on a helmet, being able to take the weight off and save the wear and tear on a night vision optic is

a good thing.

The Insight NVM-001 and the Wilcox mount to keep it on a helmet. Useful, but stay in shape, this all adds weight.

The Night Arrow 4 simply clamps onto the Picatinny rail of your receiver and you're ready to go. Well, once you zero it.



Sometimes there isn't enough light, and for those occasions ATN provides a small IR source, to boost your vision.

If you want to get into NVG and you aren't prepared to drop the cost of a compact car into one, this is a solid option.

ATN PS40

The PS40 is a change from, and up from, the Night Arrow. First of all, it is a Gen 3 optic. That means a 10,000 hour MTBF, up from the 5k of the NA4. It has much better resolution (64-72 lines per millimeter vs. 40-45 l/mm) and this happens in a package that is two-thirds the weight of the Night Arrow. However, there is a cost for this performance. Where the NA4 lists at $1600, the PS40 is listed at $4900.

It runs on either AA or CR123, and battery life is impressive here, too. On the AAs, it runs 50 hours; on the CR123s, 25 hours. Again, rechargeables give you a low-cost option for viewing juice. The PS40 passes the MIL-STD-810 spec, and while I've had some say "It isn't real military NVG," they are happy to take a look through it and exclaim at how good it is.

But you have to keep in mind one salient fact; it isn't a weapon sight. It is a night vision optic, which means you have to have some sort of aiming device to go with it. What and where matters.

If you have a day optic on your rifle that is a magnifying optic, then you mount the scope in its regular place and the PS40 ahead of it. Take the PS40 off in the day, you won't lose your zero. That's what I did for one class. We had a chance to do some night shooting, and the results were impressive. I had the PS40 on my LWRCI, and a Leupold 3.5-10 in LaRue mount. Downrange at 300 meters, I had my choice of two targets, a LaRue steel re-setting target and a deuce-and-a-half.

The LaRue was a little tough to see. Easy when the moon came out from behind the clouds, but tougher when it wasn't, and tougher still once we'd tagged it enough to blast the paint off it. The truck? It had been used over on the grenade range, and someone had poked impressive holes through it with various 40mm practice grenades.

The ATN PS40 is a night vision scope that mounts ahead of your standard magnifying optics. You get the best of both worlds, albeit at a price in weight.

Putting the ATN PS40 on or off of your regular scope does not change the zero, a big advantage for this design.

I could easily pick out various features of the truck and select to plink the cab, door, hood, box or frame rails. The pitch of the "plink" that came back through the night confirmed what kind of steel I was hitting. A lot of fun. A person at 300 meters would not have been a difficult target.

Had I decided to use a red-dot scope, I would have had to mount the PS40 to the rear and put the RDS out front. You see, using the red-dot in the regular place would put the unmagnified PS40 a foot from my face, trying to peer into a cathode ray tube display an inch across. No fun, and not much use in aiming. So, dots out front.

Our moonlight pig-slayer, using a PS40, will have a breathtakingly clear view of the hog, and on the schedule we discussed, his four and a half years of ham sandwich shooting will cost him just over a thousand dollars a year, which is about as much as he'd have spent on ammo in that time, too.

You have to be careful playing in the dark, so we used Airsoft guns. This Insight thermal sight, a CNVD-T, allowed me to see hot objects in the dark. Remember, if it's all the same temp, it is all the same image.

ATN Night Spirit 2

Sometimes you don't need to have NVG on a weapon, If you just want to observe and decide if you are going to shoot after watching, you don't need a weapons-mount NVG. Something with a tripod bushing would work just fine. The Night Spirit 2 is a Gen 2+ system, and you mount it on a tripod, turn it on and take a look. You can hold it as a monocular, but why do that, if you have the option of mounting it?

AA batteries again, and as a Gen 2+ system you have a 5,000-hour life and batteries last you a listed 30 hours. (I've gotten more than that, but I don't turn the gain way up on any NVG I use.)

With a built-in IR illumination, you can boost the Gen 2+ performance in a non-critical application and get a better view of things.

Insight

The first time I saw Insight night vision gear, it was at an industry gathering where we got to use their thermal imagers. Instead of amplifying existing light, the thermal imagers display the image as seen further down the spectrum, into heat. When I first looked through one, I could see the impression of someone's hand, where they had been leaning on a fence rail for a moment and then lifted their hand.

We later used them on Airsoft carbines and I noticed something extremely cool; I could see the heat produced by a plastic Airsoft pellet plowing though a cardboard target. I could watch the heat signature fade over the minute or so it took to completely cool. Wow. People in the darkness could not hide their heat, unless they were behind something so substantial it defeated all attempts at observation.

In passive starlight-type scopes, someone who is camouflaged and not moving can pass undetected. As long as you fade into the background, you essentially aren't there. Well, when we had a chance to use the Insight thermal imagers on a willing test subject who was invisible to regular passive NVG, he stood out like a sore thumb on thermal. Despite a really good ghillie suit, he was easy to see, track and shoot. (Yes, howls of outrage, as I directed a full-auto stream of Airsoft pellets onto him.)

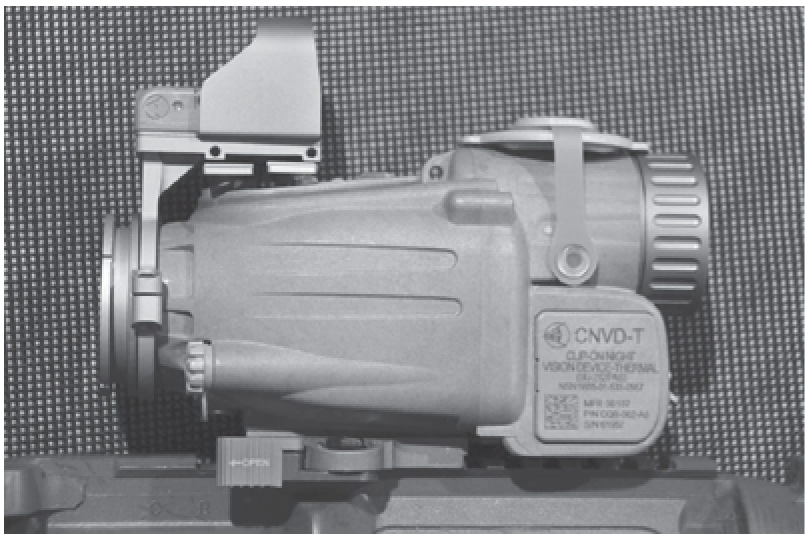
Insight AN/PAS-23

This was the one I first looked through, and it is simply a thermal-imaging monocular viewer. You can't mount it onto anything, and when it first came out the government price on one was a cool $13,000. If you want that price, you'll have to buy in volume. But cool? Ye god, yes.

Insight AN/PAS-27

This is the weapon-mount sight, and all you have to do is bolt it on and turn it on. What you see through it is the heat signature of whatever you are viewing. The image is ghostly, grainy and not all that easy on the eyes. But you can see in the dark. It has a built-in mount, but it is still just a viewer, and you need some sort of aiming optic to use with it.

If you want an all-in-one thermal and aiming device, then the CNVD-T is the Insight model you want.



The flat dark earth color Insight CNVD-T, with an accessory red-dot sight. Me, I'd rather mount the accessory red-dot off to the side and not have my face 5-6 inches above the bore. But the military gets what it asks for.

Not all NVG are mounted on the weapon, because not all night-time viewing needs require a weapon. Walking, driving, flying or working some sort of device at night require vision. The best way to manage that is to either wear it, or bolt it to something you are wearing.

Insight NVM

The Night Vision Monocular is a relatively simple NVG tube that you either bolt to your rifle in a special mount, or wear on a

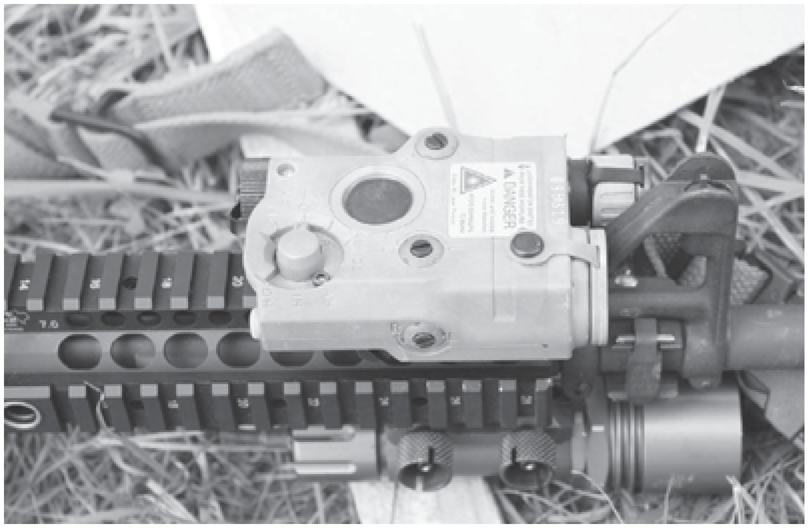
headpiece or attach to a helmet. It is a simple NVG, and for observation it is very good. If you need it to read a map or work a radio, etc., you can turn on the built-in IR illumination and the IR light provides the light source you need.

I took a Blackhawk helmet and attached a Wilcox Industries NVG mount to it. I bolted the Insight NVM to the Wilcox mount, and *viola*. I could flip up the NVM to get it out of the way. I could adjust it up, down and side to side as well as forwards or back, to get it in just the right location for viewing. And, if I didn't need it, I could detach the NVM and mount from the Wilcox rig and stash it in a storage pouch. No point in subjecting it to day-to-day daytime abuse.

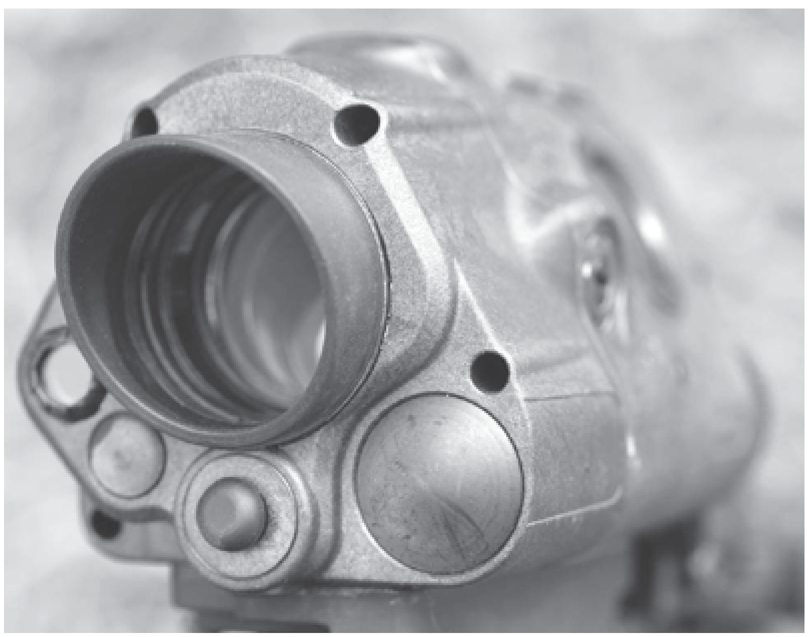
On the helmet, once properly positioned, I could use it with a regular day sight for aiming. Iron sights are not much of an option, but a scope or red-dot would be fine. Reading, walking, etc., are all do-able. It just takes some practice, because you have no depth perception. It takes some getting used to, as one eye is seeing things and the other isn't, and that can lead to headaches as you learn the system.

Insight AN/PEQ-15

For the latest in illumination and identification, the "15" is the thing. It is smaller and lighter, has a longer battery life than the 2 or 2/A, and it comes in everyone's current favorite color: flat dark earth. Also known at the ATPIAL, if you see a tan block on the front of an M4 in Afghanistan, this is it. It does everything that the AN/PEQ-2 or 2/A does, but better.



The Insight ATPIAL offers IR illumination, target marking and durability you can't hurt with a rock.



Insight makes the ISM in two versions, one with an IR laser built in (for those with NVG capacity) and a visible laser, for those who don't have night vision scopes.

The ISM (visible laser) and a qual course. Another very nice run, with only 3X down. (Again, kneeling. I really have to work on kneeling.)

Insight ISM

The Integrated Sighting Module is for those of us who do not need night vision capability very often, or at all. For the someone in Afghanistan, for instance, taking fire in a remote outpost, night vision is a big help. You're receiving fire and you can see someone moving towards your position in the dark. There are no friendlies out there, so see and shoot. In a law enforcement role, that is not an option.

The ISM offers a red-dot sight and a built-in targeting laser. Rather than have them as separate items, you have it all in one.

MARS

The MARS comes to us courtesy of the Israelis. And as combat-savvy as they are, I have to wonder just what they were thinking. It isn't particularly compact, and while it has a built-in laser, it is proportioned such that you can't use your back-up iron sights unless you pry the MARS off.

But it is cool, and for those who are building an IDF clone, a must-have of the first order.

Elcan Specter OS4X scope

Okay, an interesting approach to optic. Instead of trying to make internal adjustments robust enough to withstand heavy use, why not make the adjustments external? That way they can be a lot more robust, and the scope can more easily be sealed. And while you're at it, why not make it a switch instead of a zoom? Instead of having everything from 1X to 4X and all in-between, why not just make it 1X or 4X?

That's what the new Elcan is. At 1X it is wide-open. Pull down on the lever, then swing it the other way, and it becomes a 4X scope. As an idea, it is great. As an actual scope, it rubs me the wrong way. First of all, while it is not as heavy as I'd expected, it is every bit as bulky and full of angles, gaps and protuberances. The external adjustments are neat and easy to use, but they are a lot bigger than I think they should be.

To use your BUIS, you have to pry the Mars off, as it blocks your view and there is no co-witness capability.

The Mars sight is both red-dot and built-in laser.

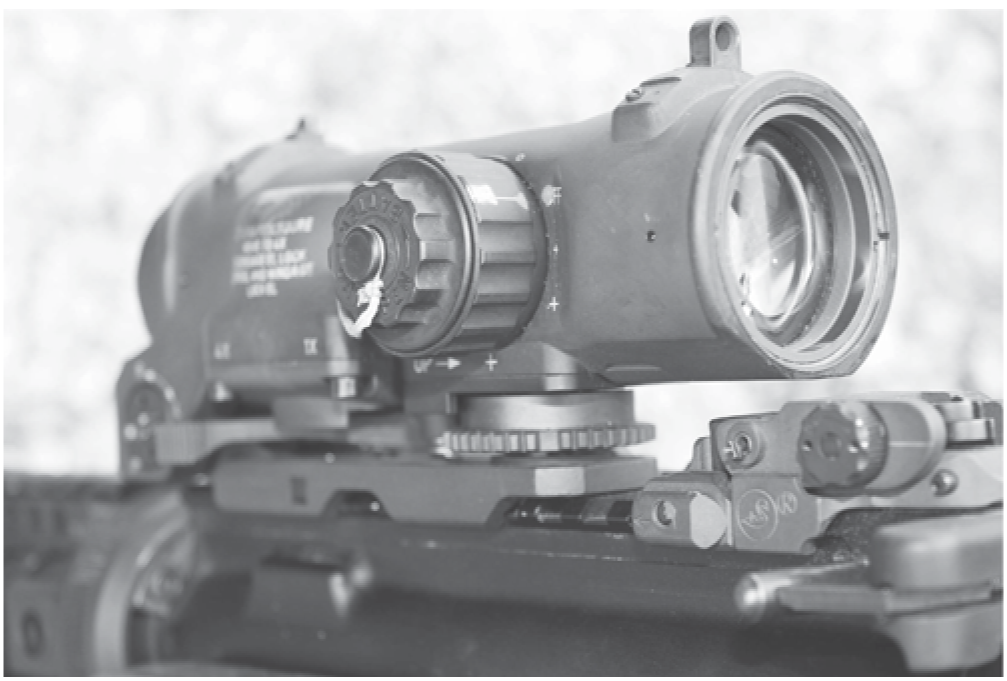
The SpecterDR is one really cool piece of optical engineering, and if you like it, it will do great things for your shooting.

Also, the reticle is all wrong. At 1X it is so small you can't see it, and you must use the illumination to make it useful. At 4X, the reticle is big and busy.

And, it is listed at $1200.

Now, a friend of mind owns one of these and it is his favorite scope in all the world. He can do amazing bits of shooting with it. (Then again, he could do amazing bits of shooting with two match sticks duct-taped to his rifle.) Me, I pick up his rifle and I just can't get used to the scope, which only goes to show that you really need to try stuff before you plunk down your hard-earned cash. Just because Delta/SEALS/ninjas use it, doesn't mean it is right for you. And if my friend had heard me not liking it before he tried it, he might not have such a good scope.

With some fine-tuning I think it could be a really brilliant optic.



The zero adjustments for the SpecterDR are on the outside, and as a result they are hell for stout. Just bulky, is all.

If you pay attention to photos from Afghanistan, you'll see lots of Acogs. The 3X or greater magnification makes it useful in the wide-open between villages.

Optics have become so common that it is rare to see a rifle, or even a machine gun, without.

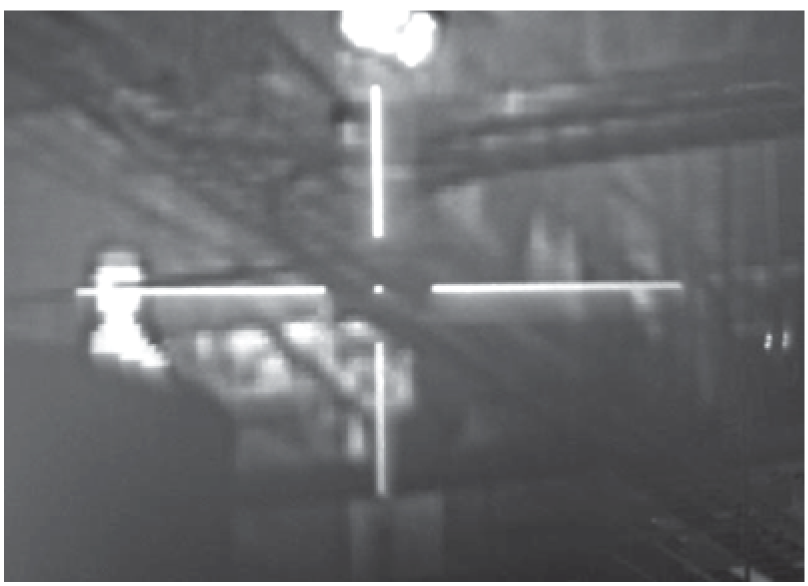
A lot of commanders allow the troops to use their own choice of optics. Plus, the SOPMOD kits each have an EOTech, so you can see a bunch of them overseas, too.

LEFT: A red-dot is useful, but if you have to reply to long-range machine gun fire, magnifying optics are useful.

Sig makes a red-dot scope for use on their AR, and anyone else's you wish to attach it to.

ABOVE: EOTech to the max. Their holosight, for the rifle, and the M4GL sight, for the M203.

GG&G makes rubber optics covers for your EOTech, with only a small amount of assembly required.



The thermal view of people in an overhead passage.

Extra optics

Just when you thought there wasn't enough that could be bolted to an AR/M4, along come electronic grenade sights. Some are simple, a scaled illuminated reticle with range hash marks on it. Others are more complex, like the Wilcox, with a built-in rangefinder and auto-cam setting so the red dot is moved to the correct angle for the range you just lased.

Between the scopes, lasers, grenade launcher and who-knows-what-else, soon a rifle is going to be 20 pounds, and firing bullets will be the least of what it does.

SBRS, CANS & COMPS, OH MY

Boarding party: Ships have narrow corridors and small spaces. A compact weapon is an asset. It just has to be reliable, is all. U.S. Navy sailors and Coast Guardsmen conduct a counter piracy operations briefing while underway in the Arabian Sea. DoD photo by Petty Officer 1st Class Michael O'Day, U.S. Navy

A generation ago, a US Representative proposed an amendment that would cripple small arms development for the foreseeable future. William Hughes proposed "freezing" the national registry of NFA 1934 firearms, prohibiting the purchase of machine guns made after May 19, 1986. In a dubious procedural process, Rep. Charles Rangel, over the objections of those present who insisted on a recorded vote, entered it into legislation.

As a result, no new machine gun has been available for purchase to US citizens. Only those in existence (and registered) can be bought, sold, traded or willed to heirs. It would not be going too far to suggest that those representatives should have failed in their re-

elections, perhaps even prosecuted for their unconstitutional acts, and the law overturned, but it hasn't been.

Since then, the price of a machine gun has gone up. Even the dullest Econ 101 student could have predicted what would happen. In 1986 you could buy an AR-15 for something on the order of $500 to $600. A transferable machine gun (when you could find a dealer who could actually get an M16 out of Colt) would sell for perhaps $100 more. The transfer tax of $200 made it half-again the cost of a semi-auto AR, so few bothered.

Today, even after the economic downturn, a transferable Colt costs on the order of $12,000 to $15,000. Ouch. At that cost, the transfer tax (still $200) is inconsequential. As a result, those wanting cool toys have had to turn to options that are less nose-bleed level and more affordable.

We are now in the era of short-barreled rifles and suppressors as "man-jewelry." The cost of an SBR is no different than that of a semi-auto carbine or rifle, except for the extra overhead for paperwork the manufacturer has to go through. So, in an era when a good AR costs you $1,000 to $1,200, an SBR is perhaps $100 more. A suppressor can cost $400 to $1,200, and its paperwork is no more onerous than that of the SBR. And the transfer tax on them is the same as the machine gun, at $200.

So, short-barreled rifles and suppressors have never been less-expensive, and more desired. But they are still a mystery to many.

Buying the goodies

Okay, to get the good stuff, you have to jump through some hoops. There are forms to be filled out and signatures to acquire. You also have to be very aware of one singular fact; you can't do anything, not so much as say "boo," until the approval, your tax stamp, is in your hands. Nothing but window-shop. You can't buy a suppressor (well, you can pay for it, but you can't even fondle it at the gun shop) until the tax stamp is in your hands. You can,

however, buy a barrel, and then be in violation of the law, so don't do that until you have approval.

You can get an SBR right from the manufacturer, or make one yourself, once you've done the proper paperwork.

U.S. Marine Corps Lance Cpl. Steven J. Zandstra provides security at a checkpoint in Sangin, Afghanistan. A suppressor makes it more

difficult for someone to tell just where the shot came from.

Also, there are two routes to acquiring an SBR or a suppressor: buy or make. They require different forms, but again, you can't do anything until you have the tax stamp.

First, you have to fill out the proper paperwork, and the ATFE is very particular about this. Your form has to be either an original, or a copy on two sides. If you copy it as two sheets of paper, they'll reject it. Period, end of story, stop whining, you're embarrassing the rest of us. One sheet of paper. No mistakes, corrections, blank spots, etc. The people who check the paperwork are massively overworked and they have no time for hand-holding. Do it right, and things will proceed.

You need two copies of the application called a Form 4. You need two copies of the assurance you are a US citizen, known as Form 5330.20, and you need two FBI fingerprint cards, stock number FBI-258LE. The ATF forms you can download, the FBI card you get at your local PD when you find out about having the signature you need (more on this in a moment).

You have to include a check for $200 in the envelope you send to ATF with all the completed forms. Do yourself and the rest of us a favor and make sure your account will be good for it. If the check bounces, they won't hold your paperwork until it clears. They'll just sweep it all into an envelope and send it back, rejected.

In talking with the people who do this regularly, the agents who handle it, the biggest stumbling blocks are mistakes in the forms and bounced checks.

There is also the little detail of a signature. You are required to have the application signed by the "chief law enforcement officer" of your jurisdiction. This may be your Chief of Police. It may be the local Sheriff. It may be both or either of them, and even some other people. It depends on state law. I've heard of Coroners, Prosecutors and others whose signatures are acceptable.

Out in the open, an SBR can hurt you. Lower velocity reduces reach.

Sometimes you can have them too short. The handgun-length barrels are often marginally reliable, even when lovingly built and maintained.

The CLEO signature is not anything more than the acknowledgement of that person that they do not know of any reason you would be barred ownership. Since they can easily do a quick “wants and warrants” check on you and see if you have any disqualifying “ding,” it would seem to be simple. In many places, it is not. The CLEO assumes no responsibility nor liability for signing, but there are many who will refuse. That’s when you make an

appointment with the next one on the list of acceptable-signature possibilities.

Your local gun clubs, if they are into “cans” and “shorties,” can often tell you who signs and who doesn’t. Also, the Class 3 dealer you’re buying from can many times tell you who to apply to.

There are also marking details you have to be aware of if you are making your own.

There is, lastly, the B-S factor from those who don’t know but think they do. One big rumor is that once you have applied, you have also signed away your Fourth Amendment rights. Not true. Simply put, you have asked to own a particular piece of controlled gear, and the government reserves the right to make sure you still own it. If there’s any question, they’ll call and you can make arrangements to drop by the office and let them look, or have them drop by and inspect it while it lays upon your coffee table in the living room. You can even have your lawyer present if you wish. They do not have *carte blanche* to search your entire house, any time they wish.

Short-barreled rifles

Now, we can start using the contraction in earnest, SBR. When you build/buy one, you can go several routes. You can buy a rifle that is already an SBR. You can take one that is a carbine/rifle and shorten the barrel. You can take one that is a carbine/rifle and replace the barrel. The factory-made SBR will have the name and address on it (the marking requirements) as to the SBR maker. If you do the work to it, you have to put your name and city on it as the SBR maker. Some people object to doing it themselves because they don’t want their name on it now and forever. Okay. Others object to it because of the cost of the marking stamps. Geez.

The big problem with doing it yourself is the middle option; shortening the barrel. Barrels are made a certain length and, when made, the manufacturer drills the gas port appropriately for that

length of barrel. If you shorten a barrel, it will still have the gas port size for its original length, and you'll have to experiment with gas port sizes, which can be a hassle. By the time you're done buying drills, drilling, testing, assembling and reassembling, you could have just bought the barrel you wanted. (After tax stamp approval, of course.)

A dependable shortie, like this LMT, good ammo, mags and hearing protection, and you have a fun day. Or a secure home.

Out in the wide open of Arizona, you can shoot an AR with just foam plugs in your ears, but get inside a building and that won't be protection enough.

Oh, there is another minor detail: you have to do the work. You can't just hand your barrel to your buddy the machinist and ask him, "Remember that favor you owe me? Shorten it to 'X' length, and re-thread it for me." If he does the work, he's the maker of that SBR. This is a particular problem, because his name isn't the one on the forms. Your name is there. You can argue that he didn't build the SBR, he just shortened the barrel, and you were the one who assembled it. Okay, fine. Does he own an AR? Is one of them at the moment disassembled, in parts? Then he has all the parts to make his own SBR.

Persnikety? Yes. Unlikely to be an issue? Probably. Borderline a pissy technicality? You bet. But people are arrested and prosecuted all the time over pissy technicalities (Ask Martha Stewart about that). So if you shorten an existing barrel, with tax stamp already in your possession, you have to, at the very least, be standing next to your machinist friend as he runs the lathe.

What do you get with your SBR? You gain noise, you lose velocity, and you will get stared at in some gun clubs. Indeed, some might not even allow you to shoot your brand-new SBR on their range. Be sure, once you have approval, that you have a place to shoot.

As the SBR is shorter, the gases that leave the muzzle are at a higher pressure than they would be at 16 or 20 inches. That means more noise. Also, as they are shorter, this louder noise is closer to your ears.

Velocity matters a bit, but perhaps not as much as some might think. Yes, if you are using softy reloads and you then stuff them into your SBR and head off to a practical 3-gun match, you may find that your ammo is so slow you fail to make Minor. In the slowest factory ammo, out of the shortest barrels (the really obnoxious seven-inch handgun barrels) you may not have enough velocity to initiate bullet breakup. You are, in effect, firing a really loud .22 Hornet. I've seen some loads doing a mere 2200 fps out of such barrels, with a 55 grain fmj. That is most decidedly not the hammer of Thor.

So, as fun as they are, you have to ask yourself if they are worth it. Quick answer: oh, yes.

Noise, and a brake intro

When you fire a round, the expanding gases push the bullet down the bore and out of the muzzle. That's where all the trouble begins. You see, the expanding gases create a jet of gases when the bullet uncorks the bore. The bullet may "only" be leaving the muzzle at 3100 fps, but the initial velocity of the gases can be a lot more. In our SBR, the velocity is lower, but the pressure of the gasses, and thus the severity of the event, is greater.

This jet of gas causes a compression wave of air. This compression is measured in decibels. The decibel scale is logarithmic, so that only increasing the numeral by about three doubles the actual

power as measured. So, increasing from (for example) 90 to 93 decibels is a doubling of the power.

The human ear is incredibly sensitive and also amazingly rugged. This has been noted by OSHA, and the standards for noise exposure have been set appropriately. Now, the human ear is not built to detect all frequencies at equal levels of sensitivity. And in an ironic aspect of design and construction, we are both more sensitive to hearing, and more damaged by, high frequencies.

Yes guys, shooting harms your ability to hear your wife's higher-pitched voice more than your ability to detect the correct timing in a V8 engine. Call it God's revenge, or joke, if you will. Also, age matters. It is a measured decline in high-frequency hearing that leads to such modern improbabilities that those who are younger can program ring tones in their cell phones that they can hear and their parents cannot. If you're curious, you can find web pages that will produce the frequencies and test for yourself.

Basically, the two numbers you have to keep in mind are 85 and 130. At 85 decibels exposure, continuous during an eight-hour workday, hearing loss occurs. An instantaneous exposure to 130 decibels means hearing loss. No, there is no way around it, them's the numbers. Dispute them all you want, but ignoring them means shopping for hearing aids as your 50th birthday party approaches.

At 85 decibels, you have to shout to be heard in a conversation. Short exposure to that will not harm your hearing. Hanging around for hours will. A single gunshot is over 130 decibels, and that will harm your hearing. How bad can it get?

The ARs we shoot, unless you're shooting something like a 9mm or a .300 Whisper, will always be over 140. Usually in the high 150s to 160 dB, even closing in on 165 in the SBRs. And, if you are shooting a short-barreled rifle, then the origin is even closer to your ears than it would be from a 20" AR-15 rifle. Dissipation also matters. A 155 dB event, outdoors, in the middle of the flattest county in Kansas, will be a different experience for your ears than the same 155 dB inside of a concrete-block indoor range. In Kansas,

you could get by with just foam plugs. Indoors, you'd best be wearing foam plugs and mickey-mouse muffs.

SBRs tend to be intimidating.

SBRs are controllable. This wasn't even full-auto fire, although the range office came along and told me to lay off the "giggle switch."

So, that is why we wear hearing protection. Even the manliest among us will go deaf without them. But, being guys, we've invented extra gadgets to help. And, to hinder.

Compensators/muzzle brakes

If you fire a rifle, the bullet leaving produces recoil, just as Sir Isaac would have predicted. But also, the jet of gases adds a component to that. So, you have a 55 grain fmj leaving at 3100 fps, but you also have some fraction of 25 grains of powder (it still has its mass, despite having been burned) leaving the muzzle at some 5,000 fps. Not all of it, as the gas laws tell us not all can leave at that velocity (and it would be an interesting calculus problem to determine what percentage of the mass contributes to the jet thrust), but there is some.

Clever fellows that we are, many of us have experimented with ways to take that gas jet and turn it into a positive. Buy re-directing the gases, we can counter (to a certain extent, despite the head-start recoil has on us) and reduce recoil and muzzle rise.

Called compensators or muzzle brakes, they can be good, bad or indifferent at their job. The best are amazing, and can take a hard-kicking round and turn it into a non-event. And note the spelling: brake, not break.

There is, as usual, a cost. That gas has to go someplace, and by re-directing it up, sideways or backwards, you spill the gases onto those next to you. It is a rare entry team that allows muzzle brakes. And after the first entry team shootout in a hallway, even rarer those teams that would continue to permit them.

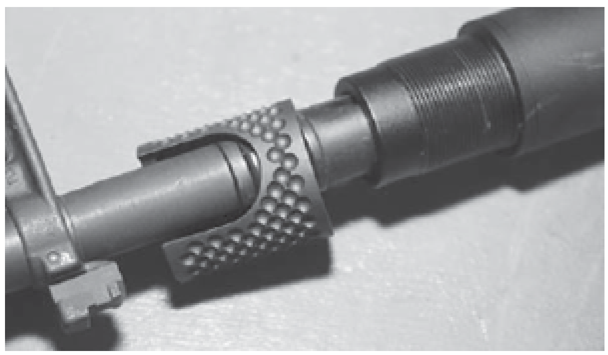
There are some that are not designed to be so aggressive. Any time you start talking about which is "best" you have to qualify what you are measuring. Do you want the least muzzle rise and backwards movement of recoil? With the least vibration as a result?

No problem, we can provide you with a comp that does that. Just keep in mind that you will have no friends when you are shooting it. The best comps jet so much gas, at high velocity, to the sides and back, that anyone standing there will suffer. I've seen the best strip paint off of painted wood in a few shots.

Muzzle brakes reduce recoil, but at a price. This isn't even the most obnoxious comp I've ever seen, not by a loud shot.

Brakes come in various sizes, shapes, number of ports and effectiveness. They are all good for your shoulder and bad for the ears of the guy next to you.

Gemtech makes a suppressor that mounts over an A2 flash hider.



Made in two pieces, the ring goes on, then the "can" slips on.

Here you can see them apart.

If you redesign it so your compatriots don't suffer, you lose efficiency. Just keep that in mind.

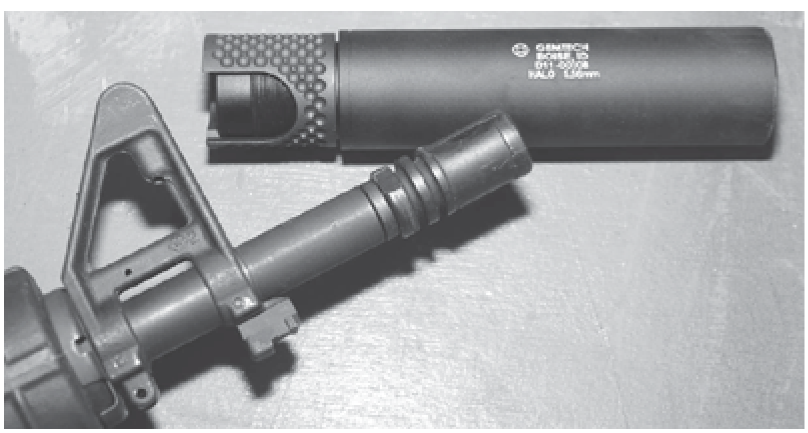
Suppressors

"Cans" work in an entirely different way than comps work. Where a brake or comp re-directs the gases but tries to retain their velocity

for best effect and efficiency, the suppressor wants to skim the gases off, re-direct and slow them down. Basically, by taking what would have happened in a thousandth of a second (the gases jetting out of the muzzle) and slowing them down until it takes “only” a hundredth of a second, the suppressor diminishes the compression wave of the muzzle blast.

Those are not the actual numbers. Calculating just how long it takes is not a trivial exercise, and the best way to determine it is to not bother. How long it takes is not the important part, what is important is that the compression wave is reduced, and from that the noise is reduced.

Suppressors work in two ways, contradictory to each other. First, they act to strip the gases out of the stream following the bullet, without actually contacting the bullet. Known as “baffle strikes,” bullets hitting the inside of your suppressor is very bad ju-ju. It is bad for accuracy, it is bad for the suppressor, and it will in short order be bad for you. The best suppressors strip the gases cleanly, so as to not disturb the bullet’s flight. The second part of the work is to take that smoothly-streaming gas and change it to turbulent flow. Turbulence breaks up the gas flow and slows down gas release from the can. It also does another thing: create heat.



Once off, screw the parts back together so you don’t lose them.

AAC suppressors use a ratcheting lock, and a dedicated flash hider or muzzle brake.

Due to slowed gas release, a suppressor-equipped rifle will have a higher cyclic rate than normal.

Surefire makes a QD-attaching suppressor. It slides on and then the ring tightens to lock it.

Where they shine is in search, close quarters, and dealing with obstacles.

Now, the Second Law of Thermodynamics (in short: you can't break even) means that if you reduce the noise, you have to increase something else. There is no getting around it, you've got to pay the thermodynamic piper. I've heard of machine guns being described as the "fastest way to turn ammo into noise," and if that is true, then a suppressor is the fastest way to turn noise into heat.

You may not want to touch a barrel after you've been shooting. We covered that in another chapter. Well, you *really* don't want to touch a suppressor after shooting. Where the barrel heating is incidental, the suppressor heating is intentional.

Buy or build?

By far, the easiest way to acquire a useful, efficient and durable suppressor is to buy one. That is the Form 4 route, and you can select from a veritable host of makers. As the market has grown, there have been previously "secret" makers popping up. Some used to make them just for LE and military, on small contracts for special groups. Others are guys who have cool machine tools, experience and a lack of regular machining business. (The economy hits all sectors hard, but some harder than others.) They get a manufacturers FFL and an SOT (the special license from the ATF that permits manufacture of controlled items) and advertise.

Buying is easy, if time-consuming. Making is the really tough part. First you file a Form 1 and wait for permission. Once you get it, you can proceed. Oh, you can do all the drawings, CAD/CAM work and the rest, but you can't put a single tool to any part that will be the suppressor-to-be until after your tax stamp arrives.

Plus, once you make it, you can't have "extras." As in, you can't have extra baffles in case yours wear. (If your "can" is a design that can be dis-assembled. If you weld it shut in assembly, that's a different predicament.) If you determine they are worn, you must destroy the old ones before you machine new ones.

At least out in the open the noise isn't as bad.

Here again, you must be the one who makes them. Unless you already have a lathe and the skills to use it, making your own is fabrication headache. Plus, there's the little matter of design.

Anyone can make a suppressor that will be durable. But do you really want a multi-pound hunk of metal hanging off your muzzle? So, how light/thin-walled can you make it before durability suffers? The makers know this, you don't. (Unless you buy one and then just duplicate it, after your Form 1 comes back approved.)

Remember, when the bullet leaves the muzzle, the bullet and gases are inside the suppressor. Just like a champagne cork coming out of the bottle, the bullet and gases "pop" into the suppressor. In an instant, your can gets hammered on the inside with the muzzle blast, which, depending on your barrel length and load you are using, can be a near-instantaneous spike of 5,000 to 15,000 psi. Will your can take it? it would be a shame to spend $200 on the tax stamp and months in waiting and fabrication only to watch your tube split on the first shot. Oops.

Mounts

You can just screw on a suppressor using the 1/2-28 threads on your barrel, but most shooters find that a bit *déclassé*. Better to use a

dedicated mount. The thing is, there is no universal mount, each maker of suppressors has their own mount.

Surefire

Surefire uses an eccentric cam to lock the suppressor on. Sort of like (for those with cameras) the old Canon FD mount, where the lens went on straight and then you turned the ring to lock it in place. The big advantage to this is repeatability, which means you don't change your zero when you take the "can" off or put it back on. This is cool, but not as vital as many think it to be.

The mount can be had as a flash hider (when the suppressor isn't on it) or a muzzle brake.

AAC

Advanced Armament Company uses a quick-thread mount and a ratchet in the suppressor to hold their cans in place. There may be a slight zero wander, and there may not, it all depends on the ammo, barrel and if your barrel plays well with that particular suppressor. The mount can be a flash hider, muzzle brake or combo unit that does both.

Gemtech

Gemtech has several mounts. One is the quickmount, a three-lugged (like the HK mount, but not the same dimensions) that allows a fast-on/fast-off mount. Also, they make a dead-simple mount that is a fastening nut that slips over an A2 flash hider and screws your Gemtech suppressor down to your A2.

More problems

Let's re-enter the gas flow laws and dynamics realm, where things do not always go as planned. Consider your AR and its gas system.

The bullet passes the gas port, and some of the gas bleeds off to power the system. As long as the bullet remains in the bore, the system is sealed and gas pressurizes the action. This is known as the gas dwell time. Each barrel is drilled for a port appropriate for the extra barrel past the gas port.

Now, put a suppressor on it. The can will extend the effective length of the barrel by some length – three, four or five inches, it depends on the model. That essentially increases the gas dwell time, due to the extra distance the gases have to travel in order to vent to the atmosphere. Your rifle runs dirtier. It isn't because the suppressor "blows more gas back" into the action; it is because the suppressor extends the gas dwell time due to length.

But wait, it gets worse. Not only has the suppressor extended the effective barrel length (as far as gas escape is concerned) but it also slows down the escape. Double-whammy.

You want real flash, go with an SBR. Even a good flash hider works overtime and often still can't keep up.

That's why a lot of suppressor owners are very fond of piston systems. They can (if the system permits) throttle back the gas flow. They also keep the extra gas flow out of the receiver.

Combine that with an SBR and you can see the problems. Ferocious gas flow to work the system with a short barrel (short barrel past the gas port is the critical part) and then that ramped up

by a suppressor lashed onto the front, radically increasing gas dwell time.

Answer? A dedicated suppressor upper. After all, you've spent $200 on the transfer tax and then $400 to $1200 on the suppressor. Building a new upper for it (SBR aside) is not that much. A quick check of parts prices gets me to about $300. Build your upper, tune it for the suppressor and then leave the can on the mount except to clean the bore or the suppressor. That way you don't have varying gas flow problems, you don't have wandering zero issues, and you have a very cool upper to take to the gun club.

One final man-jewelry note

Yes, if you plan to build/buy an SBR, and build/buy a suppressor, it is a $200 transfer tax each. The only way to get around that would be to design and construct a 16+" barrel with a permanently-attached suppressor in combination. You will have to apply for it with the ATFE, and you'd better be absolutely sure it is permanently attached. If someone fits a pipe wrench to it and removes your suppressor, short of destroying it or the barrel, it is a Federal felony. Good luck in the design and fabrication. And do the paperwork first. (Can't remind you too many times, can we?)

In the beginning of this chapter I asserted that our representatives were at the very least incompetent or exhibiting misfeasance. And at worst, malfeasance. Why? Simple: the Hughes Amendment to FOPA 1986 has directly harmed small arms development for a generation. The cost of a transferable machine gun has gone through the roof. An M16 can cost $15,000. A squad automatic weapon, the M249, when you can find one, runs on the order of $50,000. An M60 or M240 GPMG? The "pig" as the M60 is known in some circles, will "only" cost you as much as the M249, $45-50,000. The M240 will start at $85,000. (I was recently told by a fellow gun writer that the new-in-box M240 I had found in this research was "a steal" and if any of us had any money with sense we should jump on it.)

At those prices, no-one is going to experiment on improving any of them. Unmolested, and fired with restraint, they do not lose a penny of value. Start cutting, changing and altering, and the re-sale value plummets. Experiment, you ask?

Let's take some specifics. The AR-15, as it is now, is at its level of refinement and reliability not because of the government, but in spite of it. Experimenters not in government service have developed all the advances. Your railed handguard? It came from civilian experimenters. Your match triggers, improved flash hiders, better stocks? Ditto. That extra-strength spring under your extractor? While it was adopted by the Army, it wasn't developed by them.

Different ammo, same result.

One big example: Magpul PMag30s. Once the egregious Assault Weapons Ban of 1994 expired in 2004, we could buy new hi-cap magazines again. At that time USGI aluminum magazines were essentially no better than they had been since 1971. With a civilian company making utterly reliable magazines for non-military sales, other magazines made by their competitors suddenly were seen as insufficient. And, as market forces do, those who made competing products had to improve their magazines. They did, and all this happened not just without government assistance, but in spite of it. Suddenly the Army, Marines and all others had improved followers and springs, in more tightly-controlled aluminum tubes, to use.

When the supply people were told over and over again that the issue magazines were junk, they'd shrug and say "It's what we have." When troops walking the streets and canyons in combat zones are seen using non-USGI magazines, magazines that they paid their own money for, the supply people have to get better magazines, or be asked why not. Careers end when questions like that can't be answered.

Examples where improvements have been stalled: the M16A2 was fielded with a three-shot burst mechanism. It is perhaps the worst design of any of them. It interferes with the consistency of single shots, it doesn't re-set if you let go mid-burst, and it adds a lot of parts that are not easy to disassemble and clean. (Not that the Army allows soldiers to take the lower internals apart. They barely trust soldiers with live ammo, they aren't going to trust them to disassemble lowers.)

As long as M16s are $15,000 and more, and there are no new ones to be had, no-one is going to spend time designing a new 3-shot burst mechanism. If an M16 were only $100 more, retail, than an AR-15, the three-shot burst design would have been perfected 20 years ago and refined even more ten years ago.

How about the M249? Reports are that it is a real bullet hose. Accuracy? At 300 meters, where you could use any of a host of other designs and tap out a 5-7 shot burst and be certain of a hit, the dispersion of the M249 is so great that an otherwise excessive amount of ammo would be needed.

The government buys them in volume for $3,000 each. At retail, that would be something like $4,500, instead of $45,000. At $4,500 each, gunsmiths and experimenters would have solved the accuracy problem.

Why hasn't the Army solved the 3-shot burst, or the M249 dispersion problems? Because no one has authorized them to, that's why. One experiments on government property at the peril of one's career.

The M60 was developed by the government. It was widely hated, roundly denounced, and for its entire career viewed as a barely-serviceable GPMG. It has, as far as I have heard, been perfected, by a company that did so on their own, and not for the Army. However, they have a limited market. The Army isn't going to buy it. They'd have to admit to three mistakes in a row (buying it, not de-bugging it, and then ditching it and being guilted by the USMC into buying the M240 as a replacement).

If it had been something we could all aspire to own, those problems would have been solved a long time ago. The Army can close its eyes to faults in a weapon system and paper over the steps they have to go to keep it (barely) functioning. But if an individual buys one, and it doesn't work, the company that sold it hears about it. If they can't solve the problem, then enterprising gunsmiths will step up to give it a try. Those that succeed will have careers fixing the product.

Want an example? How about the 1911? Colt, when they owned the market, couldn't be bothered to make them reliable. Gunsmiths fixed them. When people who wanted 1911s that actually worked got to be a big enough market, other companies stepped in, took market share from Colt and make reliable 1911s. Imagine what the situation would be like, if the 1911 was a monopoly item by Colt, for the government only, and we couldn't afford one. Yes, just like machine guns.

Enough of this particular rant, let's get back to testing and abusing AR-15s.

DO WE REALLY NEED THOSE RINGS?

You take them off by winding them out, not simply grabbing one and yanking on it. **(Photo courtesy Ned Christiansen.)**

A question that comes up regularly concerns the gas rings in the bolt. Even today, the Army instructs soldiers to assemble the bolt into the carrier with the gas rings staggered, to prevent gas blowby. The fact is, and repeated testing has shown, that not only does the orientation of the gas rings not make one whit of difference, but that the rings cycle around the bolt as the bolt opens and closes, so this careful misalignment may be (and probably is) repeatedly undone as the bolt works back and forth.

That said, let's move on to a different question entirely, and one that comes up in each of our patrol rifle operators, instructors and armorers classes: do you need all three?

The purpose of the gas rings is to close the gap between the bolt and carrier and prevent gas from blowing forward into the breach area. If you get a chance to watch high-speed video, you'll see jets of gas come out of the vent holes in the carrier. The vent holes are a self-throttling mechanism in the system. By allowing gas to vent, the system can produce enough pressure to work the carrier, but that excess is bled off. Alas, insufficient gas is not something the system can cope with, and if you do not have enough gas, or the gas bleeds off too quickly, you get a short-stroking rifle. As I've said before, short-stroking is often viewed as a gas port problem by the unpracticed, and they (if allowed to) will drill the gas port bigger before they check something as simple as "is the carrier key tight?"

Losing gas rings is easier than you'd think. When shooters see the gobs of carbon that accumulate on the tail of the bolt, it is a strong impulse to grab a brush and scrub the carbon off. Particularly if you use the brushes with stainless bristles, it is easy to flick a gas ring off the bolt. Unless you make it a point to count them before you reassemble the rifle, you may be down a ring or two.

The classic test for gas ring friction is to stand the assembled bolt on its head and see if the weight of the carrier causes the bolt to collapse closed.

The test for "how many rings is enough" is easy. Take them out until it stops working.

I figured there had to be a way of recording the results, so I took three rifles to the range with plain old ammo, in this case Black Hills 55 grain fmj remanufactured ammo. I'd shoot ten rounds with all three gas rings in and plot the locations of the empties. Then I'd remove one ring, re-shoot and re-plot. I figured I would obtain interesting info and perhaps even an interesting photo or two.

A close look at the gas jets. This happens every time you shoot.

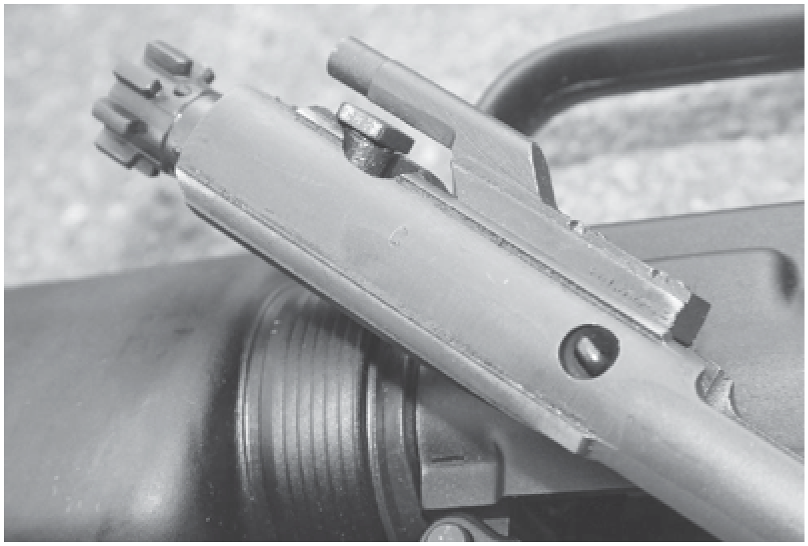
I would also do the assembly check: stand the bolt/carrier assembly up and see if it would stand with less than three rings. Just as a check to see whether, by using the test, we can detect a gas ring shortage.

The first rifle is my Rock River Arms Elite Operator. A 16” direct-gas AR with the Rock River ultra-cool railed but oval handguard and their very solid operator stock, it is a rock-solid and reliable rifle. With three gas tings, it tosses the empties a dozen feet to the side and a few feet forward. Taking a gas ring out doesn’t decrease the distance thrown, but the pattern they fall into is much larger, indicating a decrease in consistency of cycling. With two rings, however, it still works 100% and still locks the bolt back. With but a single ring, things get dicey. It occasionally short-strokes, and suffers bolt-over-base failures. The bolt simply isn’t being driven back far enough, and running with a single ring is not at all advisable. Taking all the rings out turns it into a straight-pull bolt action rifle.

The little flags on the right are the locations of the ejected brass. I had this idea that there would be a significant change in the pattern as I removed gas rings. Silly me. While the pattern got less-consistent, they flew just as far.

The second rifle is also a carbine, and in this case I used my Colt. The results with the Colt were almost identical to those of the Rock River. Three rings, cool. Two rings, reliable enough in a pinch. One ring, not very reliable, and with no rings, a single-shot rifle.

The third rifle I snatched out of the rack almost as an afterthought. It is a Century Arms C15A1, a parts gun imported by Century. They took M16A1 parts guns (select-fire rifles can't be imported, not since 1986), brought the parts in, and assembled them on new semi-auto only lowers. It is a 20" pencil-barrel rifle that, except for some cosmetic differences, could be any Colt made from 1965 to 1985. With three gas rings, it ejects the empties directly to the side, some twelve feet away. The pattern is oval and the long axis is towards the target. With only two rings, it throws the empties just as far and in the same direction. The pattern is larger, indicating greater variance in cycling force and speed.



The Century Arms C15A1, with its M16A1 bolt and carrier, worked 100% with absolutely no gas rings in it. Color me surprised.

With a single ring, the rifle still ejected all the empties, in the same direction, just not as far.

With all the gas rings gone, the rifle still cycled 100%. That's right, it spat out the empties on every shot, although it did not lock the bolt open when the magazine was empty. To say I was astounded is correct. To say the two club members watching were amazed is also correct. None of us expected it to run 100% with just one gas ring, but to do so with none was jaw-dropping.

Now, should you be doing this? Not a chance. The rifle is a system, and it was designed to run with three gas rings. Leaving one or two out because you're cheap is, well, stupid.

What's going on here?

Let's take a moment and discuss what is going on here. You press the trigger and the primer goes off, the powder ignites, the bullet goes down the bore and, finally, the gas hits the gas port. It jets back into the receiver. Having a sense of the time involved is important. The gas does not travel from the port to the carrier instantaneously. It takes a few milliseconds to do that. As it does, the bullet is continuing to travel forward, and the movement of the

bullet is decreasing the gas pressure. Admittedly, the gas pressure change rate is much slower by then, but it is still happening.

Additionally, the gas bled off also decreases pressure in the system. Plus, the much smaller diameter of the gas tube acts as a valve, lowering pressure even more. From talking with AR manufacturers, I found that the pressure within the carrier, at its max, is about a tenth of that of the gas at the port. Rifles, lower pressure, carbines, more, but still a ten-to-one decrease.

Also, in the time the bullet has traveled, the pressure in the case (which, by the nature of the various gas laws, must) has also dropped. So when the bolt begins to turn, the case pressure is not anywhere near the 50-60,000 PSI that it had been at its peak.

So, what do the gas rings have to do with this? For one, they prevent gas leaking forward, towards the bolt. The pressure in the carrier has a forward thrust on the bolt. How much? My sources are cagey on this point, perhaps not wanting to reveal knowledge that cost them many thousands of dollars to measure precisely. So, we'll take a first-pass calculation. The diameter of the bolt tail flange (I grabbed a bolt out of the parts drawer and measured it, if these numbers don't match your blueprints don't blame me) is .487" So, using πr-squared (you do remember basic geometry, right?) we come up with a surface area of .186 square inches. But wait, don't forget the bolt tail. The center shaft, the tail, reduces the surface area, so we have to calculate and subtract it. At .248" in diameter, it reduces the surface area gas has to thrust against by .048 square inches. That leaves us a mere .138 square inches to work with.

Can you put the rings on incorrectly? Until I saw this bolt, I would have said "No."

The pressure of the cartridge at peak is (let's go high, here) 60,000 PSI. If the case acted as a frictionless cylinder, the back-thrust would be (case rim diameter of .378") 6,733 pounds. Clearly that is not the actual thrust, as a millisecond-building impact of 6,700 pounds on the locking lugs would break them clean off. So obviously, the expanding case, creating friction on the chamber walls, takes up a lot of that thrust. Let's assume for the quick calculation that the case knocks 90% of that off, and we're left with 670 pounds of back-thrust.

Before we continue, remember the time sequence: the peak pressure, and thus the maximum back-thrust, occurs very early in the system. The bullet has just begun to enter the rifling when this happens. By the time the gas flows back, chamber pressure has dropped to a "mere" 15-20,000 PSI or less, and the case can begin to think about contracting back near to its original dimensions. It is at this time that the carrier pressure slams into the rear end of the bolt.

For the example, we'll take the gas port pressure as 15,000 PSI. That delivers 1,500 PSI to the carrier. At .138 square inches of area to work on, that gives us 207 pounds of counter-thrust. Interesting. If the case does provide enough friction to in effect eat up 90% of

the back-thrust, then the gas in the carrier is 30% of the back-thrust as a counter.

If we remove that (we can't, even lacking gas rings), we in effect increase back-thrust on the locking lugs, and thus the frictional load to rotate, by over 50%. Of course, the less the case walls eat up, the less effect the counter-thrust has.

But there is more. Gunsmiths who build ultra-accurate rifles know that even loading of the bolt lugs (in any design) on the locking surfaces enhances accuracy. That is, if one is "taller" than the others, the bolt will try to tip when the load is applied. Since there is a strict limit to how much it can tip, then the force acts as a bending component on the bolt face and lugs. Even contact increases accuracy. It also increases service life. As a mass-produced item, the AR cannot have full and complete lug engagement on all seven lugs. (The eighth would be where the extractor is.)

So, it is inevitable that there would be uneven loading of the locking lugs. If the bolt were allowed to tip due to this uneven loading, the forces generated could break lugs. However, the bolt tail flange, containing the gas rings, is a tight fit in the carrier shaft. The tail itself isn't so much, but the gas rings are a frictional fit to the carrier. Combined with the fit of the bolt tail in the rear portion of the carrier, the gas rings act to severely limit the amount of bolt tilt that can occur. Without tilt, lugs that are over-loaded cannot shear, and instead the tallest one undergoes a microscopic setback. In essence, the initial firing acts as a force that irons out the toolmarks on that lug, shortening it, and evening out the load.

The Century C15A1 proved so reliable I kept it.

Keep in mind that the toolmarks are not even a tenth of a thousandth, and the setback is less than that. But it is enough to even out microscopic inconsistencies in the manufacturing process.

However, if allowed to tilt, they will experience non-axial stress and shear. Bad bolts break, in part, because they are not even in their loading on the barrel extension locking surfaces.

If this off-the-cuff calculation is correct, then we would see breakages on rifles that lacked gas rings, if they were fired enough. However, to detect this we'd have to have a sample far larger than what I possess. It would take something like a shooting school, with loaner rifles, and a high volume instructional plan. Then, the armorers could track rifles, and if some showed up broken, see if they lacked gas rings, and how many. When I get a chance to dive into an informational gold mine such as that, I'll report back.

When I fired the Century Arms C15A1 and it worked with no gas rings, I was amazed. Now I wonder how much of the service life of the bolt have I used up, testing it to see if it would function. So, count your rings, every time you assemble your rifle, and make sure you are giving it every chance to perform to its potential.

After thinking about this, it occurred to me that perhaps we can prevent this gas ring shortage problem by testing for rings. We all know the test to see if gas rings are worn too much: stand the

assembled bolt/carrier on its head, and if the weight of the carrier causes it to collapse, then the rings are too worn. They may not be too worn, they may still have thousands of rounds of life left in them. But we have no test to check past that point, so out they go.

So why not use that test to see if you have enough rings, as well as if they are worn? Nice try, but it doesn't work. I tried it with the same three rifles, and I found an interesting thing: they would all stand up, un-collapsed, with but a single ring installed. One (yes, it was the C15A1 from Century) would stand with no rings. So that idea is a no-go. If you want to ensure that your bolt has the correct number of gas rings, you're going to have to look and count to three.

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